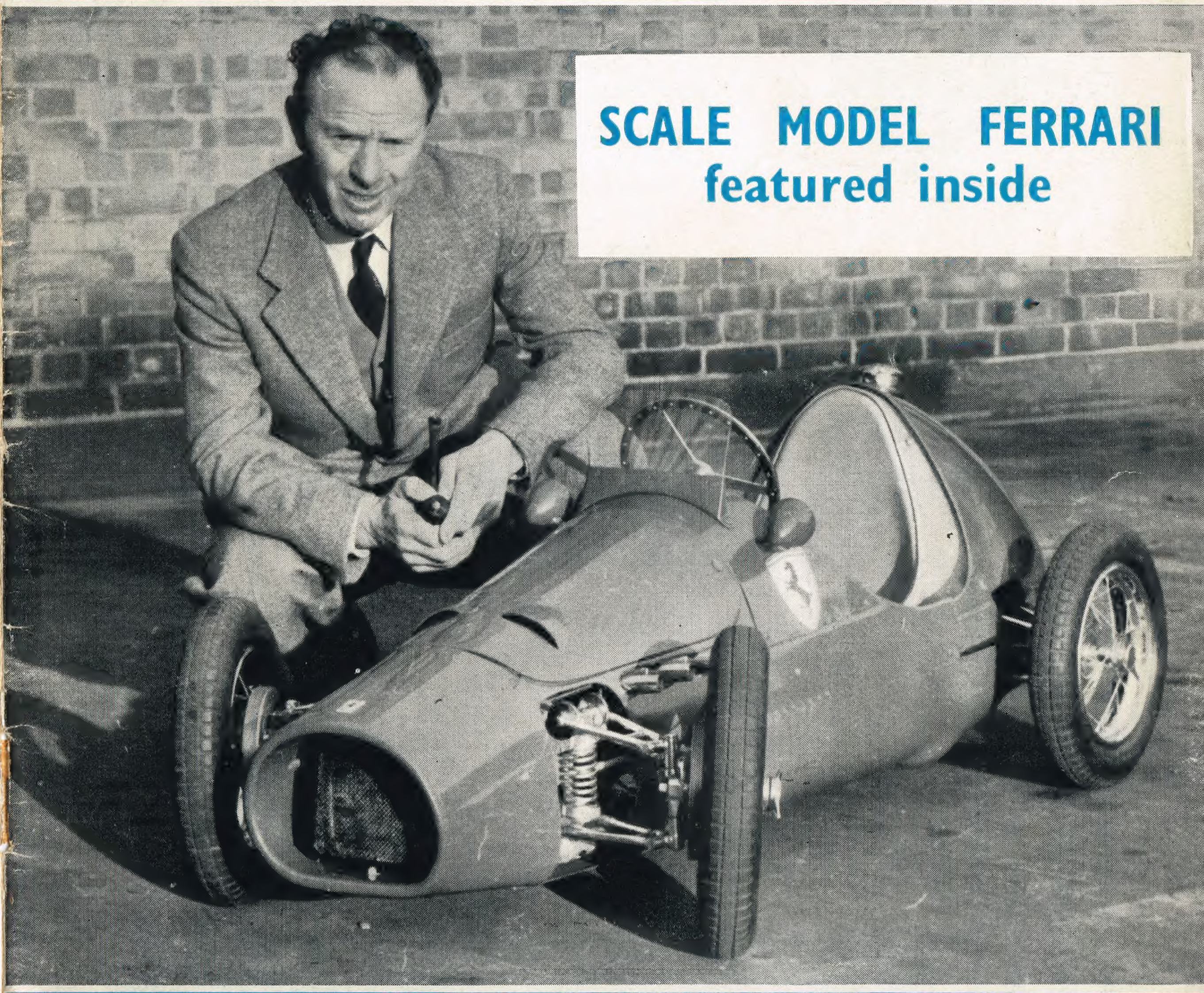
THE MODEL ENGINEER



SCALE MODEL FERRARI
featured inside

IN THIS ISSUE

- SIMPLE WOODEN HULL CONSTRUCTION FOR MODEL SHIPS
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- TWIN SISTERS—BUNKER DETAILS
- LATHE BEARINGS

MARCH 3rd 1955
Vol. 112 No. 2806
9D

200 Toolmakers Vee Blocks 1½" square, 2" long, large vee one side and small vee other side, complete with clamp, bargain 15/- per pair with one clamp, actual present-day value 35/-. An essential tool for drilling or milling round stock.

300 Toolmakers Clamps, ¾" square steel jaws, 5" long, M. & W. pattern, new and unused, but a bit rough through handling, quite serviceable, gift 5/9 each, 10/6 pair. Worth about 12/6 each.

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60 Spot Facing Cutters as used for facing bolt holes on casting, 2½" dia., 1" dia. shank, ½" hole for pilot, honestly worth 40/- each. Bargain 7/6 each. All high speed.

500 Sets Figure and Letter Punches for steel marking, size ¼", gift, figures, 5/-, letters 15/- per set.

80 High Speed Milling Cutters, 1¾" dia., 1¼" wide, ¾" hole, these have 1" wide plain cutting straight remainder of width is tapered angle, cost 35/- each. Given away at 5/- each.

100 Hand Reamers, spiral teeth, 27/32" dia., clear 3/6 each. Worth more than four times this price.

1,000 B.A. Hand Taps, Sizes 0, 2, 4, 6, B.A. in tapers, seconds or plugs, 1/- each, 8/9 per doz., any size or sizes.

60 Heavy Duty Ball Races, ⅜" bore, ⅞" dia., ⅝" wide, two ball races in one 4/- each, 7/6 pair.

50 High Speed Shell End Mills, 2" dia., 1¾" wide, worth 62/-, clear 15/- each ; ditto, 2½" dia., 2¼" wide, 20/- each.

80 Plain Spiral Teeth Milling Cutters, 2½" dia., 1½" wide, 1" hole, 15s. each.

50 High Speed End Mills, ⅞" dia., No. 1 M.T. shank, 10/- each ; also straight shank end mills, high speed, ¾" dia., 7/6 ; ⅞", 10/- ; 1", 12/6 each.

1,500 H.S. Morse Taper Shank Twist Drills. Brand new, Firth Speedicut, Balfour Capital, etc. This is an opportunity to secure a really good range of sizes at about a quarter of fractional size cost. No. 2 Morse Shank, 14 mm., 4/6. 16 mm., 5/-, 17 mm., 5/6, 17.5 mm., 18 mm., 18.5 mm., 6/- each. 19 mm., 20 mm., 20.5 mm., 21.5 mm. 6/6 each. 22 mm. and 23 mm., 7/- each. No. 3 Morse Shank, 23.5 mm., 24 mm., 24.5 mm., 8/- each. 26 mm., 26.5 mm., 9/- each. 27 mm., 27.5 mm., 10/- each. 28 mm., 29 mm., 29.5 mm., 11/- each. No. 4 Morse Shank, 40 mm., 30/- each. We strongly advise our clients to secure a stock as early as possible. Orders of £2 value less 10 per cent. Order of £10 value less 15 per cent.

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80 Only, H.S. Slitting Saws. 4" dia., 1" hole, 1/16", 3/32" and ⅛" thick, 6/- each, three for 17/6. Also 7" dia., 5/32" thick, 1" hole, 17/6 each. Also 8" dia., 3/32" thick, 1" hole, 20/- each.

500 H.S. Side and Face Cutters, thin type, 5", 6", 7" and 8" dia., all with 1¼" holes, 3/32, ⅛", 5/32", 3/16", 7/32", ¼", 5/16" thick. Price list on application.

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350 Interlocking Cutters, side and face, 3" dia., 1" hole, ¾" wide. Two separate cutters, bargain 20/- pair. Actual value £5.

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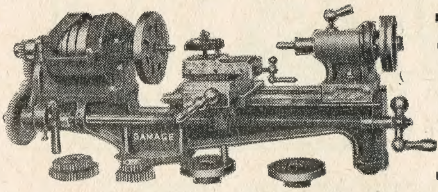

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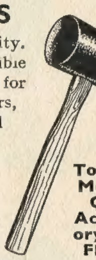

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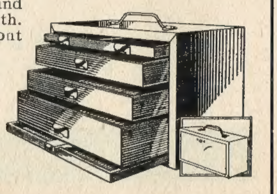

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THE MODEL ENGINEER

EVERY THURSDAY

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OUR COVER PICTURE

Mr. W. P. Jones, the constructor of the scale model Ferrari racing car shown here, and which is the subject of a detailed and illustrated article elsewhere in this issue, is known to many readers for his activities in both full-size and model car racing. He was a founder member of the Pioneer Model Car Club, which lived fully up to its name in laying the foundations of power-driven model car racing in this country during the latter part of the war. In this, his latest effort, he has not installed an engine, as the car is intended for his small son, and is therefore pedal-driven; but in respect of chassis and body details, it is remarkably complete and accurate, and deserves to rank very highly as a faithful replica of a famous racing prototype.

The Duke of Edinburgh Trophy

WE WOULD remind our readers that this coveted trophy was inaugurated at the "M.E." Exhibition last year, and that the entries for it made a brave display indeed. Every effort is being made to ensure that the standard then set shall be at least equalled this year. The qualification is that each entry shall have been awarded a Championship Cup or a Silver Medal, not less than three years ago, at the "M.E." Exhibition. All eligible competitors are requested to apply immediately for entry forms, fill them up fully and return them without delay to The Exhibition Manager, Percival Marshall & Co. Ltd., 19-20, Noel Street, London, W.1.

Birmingham National Rally

THE BIRMINGHAM Society of Model Engineers' annual national rally of steam locomotives will be held this year on June 11th and 12th. It will be, as usual, at the society's fine track at Campbell Green, 87, Horse Shoes Lane, Sheldon, Birmingham. Given good weather, the event is certain to be a memorable one, and visitors with locomotives always meet with the heartiest of welcomes; those wishing to be present should note the above dates and watch for further details which will be published later on.

Ordeal by Question!

WE COMMENTED recently on the awkward problems which are often submitted to us by querists, many of whom do not realise that a good deal of unnecessary difficulty is caused by their failure to state such problems in concise terms, or to put us properly in the picture regarding the practical nature of these problems. Sometimes we take a good deal of trouble to solve a problem which is subsequently found to be very different from what was vaguely implied by the querist—or even, on occasions, to be really non-existent!

As an instance of this, we recently encountered a query regarding the working out of a gear train to produce an exact output speed from a very odd input speed. This introduced into the calculation a prime number of large magnitude, which, having no factors, could not be cancelled out except by using a wheel having an exceptionally large (and odd) number of teeth. It occurred to us to wonder why the particular input speed should be necessary, and on putting this to our querist, we found that the source of power employed was one which was obviously capable of regulation within sufficiently wide limits to eliminate the odd number!

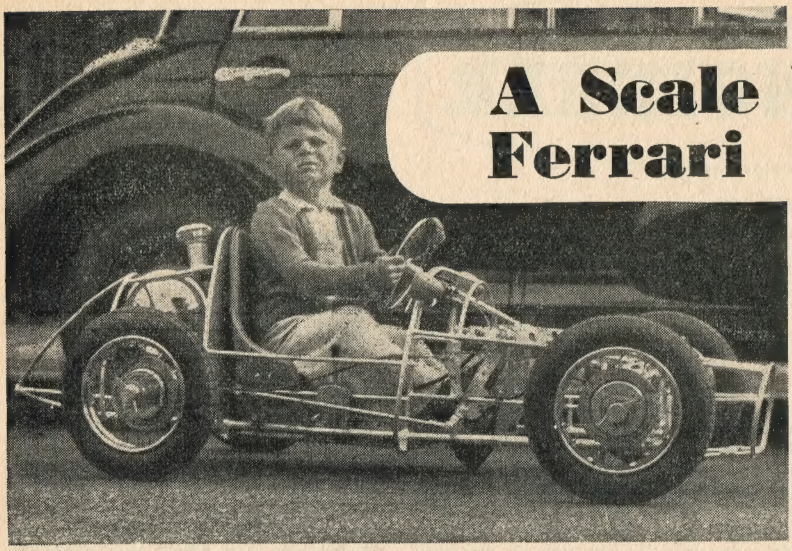
This is but one example of the type of query which can only be regarded as a waste of time both to us and the querist, and it will be generally agreed that we are justified in asking our querists to state their problems in exact terms, giving as much information as possible on all factors which have a bearing thereon, and a clear idea of the results they wish to achieve.

Adjusting a Spirit Level

A CORRESPONDENT who, unfortunately, did not sign his name, sends some advice on how to adjust a spirit level; his letter is in reply to a recent query we published from J.W.D.P. of Nairobi. Apparently, our querist has been endeavouring to correct the level by adjusting it for the whole error, whereas he should adjust for only half the error, assuming that a level surface is being worked on. The following method is suggested:—

To one end of a stout strip of metal, or wood, fit a levelling screw; or a slow wedge might be used. Let us call this gadget the "base." Set the base reasonably level; place the spirit level on it and note the reading, or make a mark on the spirit level. Now reverse the latter and note the reading again, or make another mark. Adjust the levelling screws on the spirit level until half the error is eliminated, then adjust the levelling screw in the base until the other half of the error disappears. If necessary, this process should be repeated, more than once, until the spirit level can be swung with the bubble stationary.

This information may be useful to all owners of doubtful spirit levels, who will, doubtless, wish to join us in thanking our anonymous correspondent.



A Scale Model Ferrari Racing Car

A PEDAL-DRIVEN VERSION OF A FAMOUS 2-LITRE GRAND PRIX PROTOTYPE

By

Geoffrey Deason

"Show me this Fangio!"

WHILST sheer size is not of necessity synonymous with merit, there is an undeniable appeal to the imagination about a model large enough to contain or transport its owner, who is thus able to take a much more realistic view of things than if, like Gulliver, he is "on the outside looking in"! Perhaps for this reason, most of us who were youngsters in the golden age of motoring will recall the burning desire to own one of those shiny pedal cars which, in pre-Tri-ang days, were to be seen only in the more expensive toyshops. These early commercial products were usually crude in outline, of somewhat dubious lineage, and the de luxe editions were vaguely but seductively labelled "Torpedo Tourer."

There have appeared over the years, however, a number of "one-off" child-carrying models of far greater engineering merit, mostly built by motoring enthusiasts with a taste for model engineering and a suitably sized offspring as an excuse. *Model Car News* in its day ferreted out some notable specimens, their motive power ranging from pedals to large electric motors and small petrol engines, which aroused no little interest amongst readers at the time.

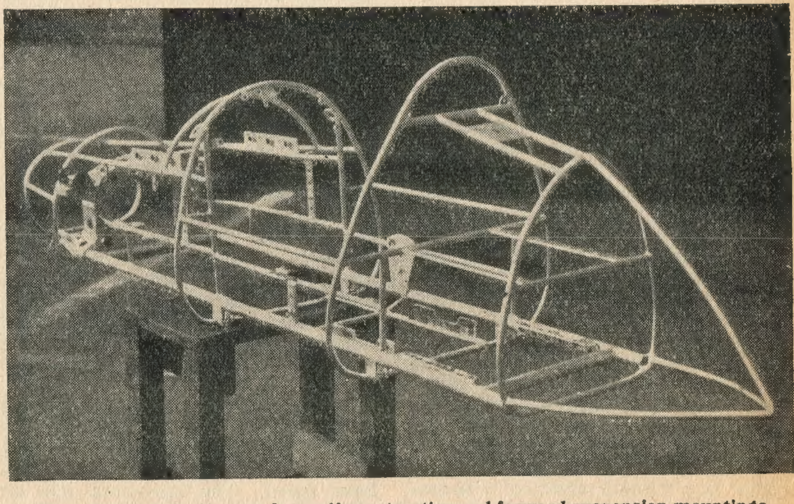
A Local Product

Recently THE MODEL ENGINEER found, almost on its doorstep, something quite exceptional in this line. Its creator, Mr. W. P. Jones of the Poland Street Garage, W.1, will be well remembered by most followers of model car racing as a pioneer record-breaker, and a successful exponent of high-speed models with a true-to-scale look. Mr. Jones has for long been associated with full-size racing cars, and is frequently in attendance on highly potent machines at Silverstone, Goodwood and elsewhere, so his choice of a racer as the subject for a super-miniature for his young son is hardly surprising. At the time when work on the project commenced, the 2-litre 4-cylinder Ferrari, "guinea-pig" for the present G.P. Formula cars, was sweeping all before it in road-racing events, was a trim and handsome car into the bargain, and an obvious choice for a de luxe miniature built in the grand manner.

It was to be a *real* Ferrari, not merely a Ferrari-shaped body on four wheels, and with this in view Sig. Enzo Ferrari himself was approached. The great man showed considerable personal interest, and supplied not only drawings, but the authentic yellow and black Prancing Horse transfers, proud emblem of Scuderia Ferrari, to grace the scuttle of the model. From that moment onwards it just *had* to be a pukka job!

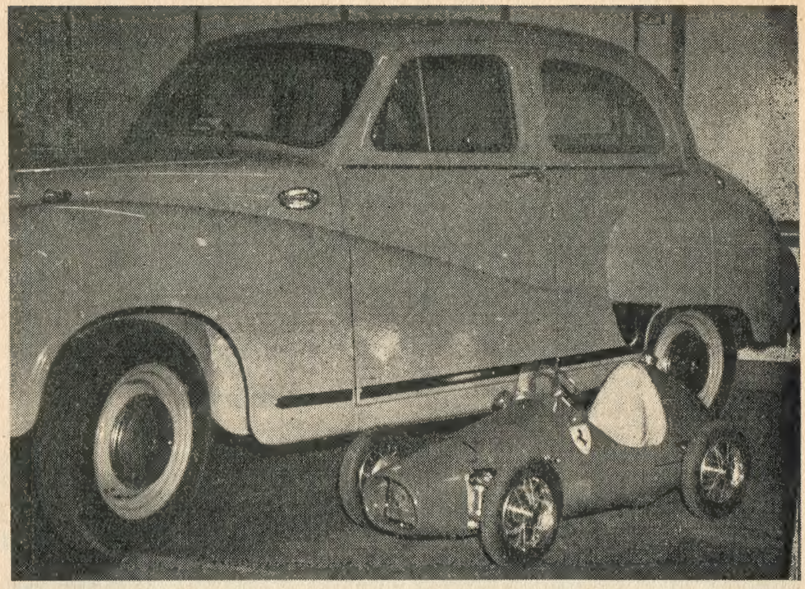
Correct racing-car practice was followed for the frame, which is of light-gauge steel tube with welded joints. The main members, two parallel tubes, are of $\frac{3}{4}$ in. diameter, and from these are built up the $\frac{3}{8}$ in. diameter body framing, as in the prototype. The anchorage for the front suspension units again owes its origin to full-size practice, and is a fabricated boxed structure of light-gauge steel plate which serves the additional purpose of stiffening up the front end. This may be clearly seen in the photograph. Attached to this structure is the centrally-mounted steering box.

The front suspension members, which would pass any scrutineer of racing "half-litres" with flying colours, are of the well-known unequal length wish-



View showing the "space frame" construction and forward suspension mountings

bone pattern, controlled by single large coil springs, the whole assembly being beautifully made and finished. At the outer extremities of these wishbones are cross-pins carrying ends in which the steering pins swivel. These steering pins are machined from steel bar, and all steering angles are correct to full-size practice. The central steering box is machined from solid dural, and houses a rack and pinion gear, the rack being cut from the standard rack as fitted to the Myford M.L.7 lathe. This arrangement provides a ratio of 1½ turns of the steering wheel from lock to lock.



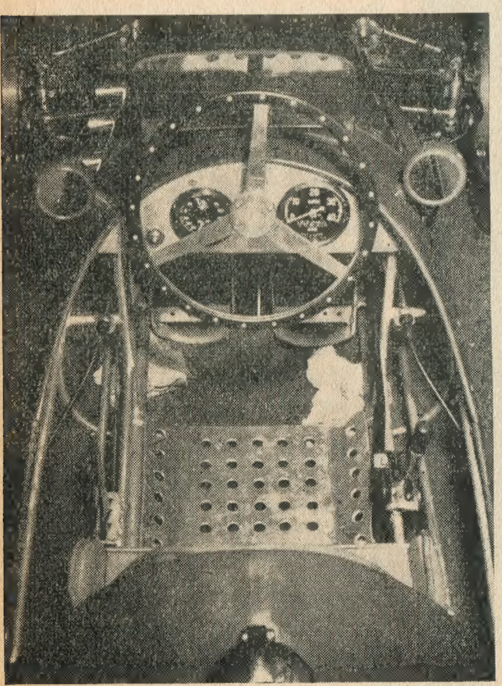
A comparison of size, the Ferrari model seen alongside an Austin Hereford

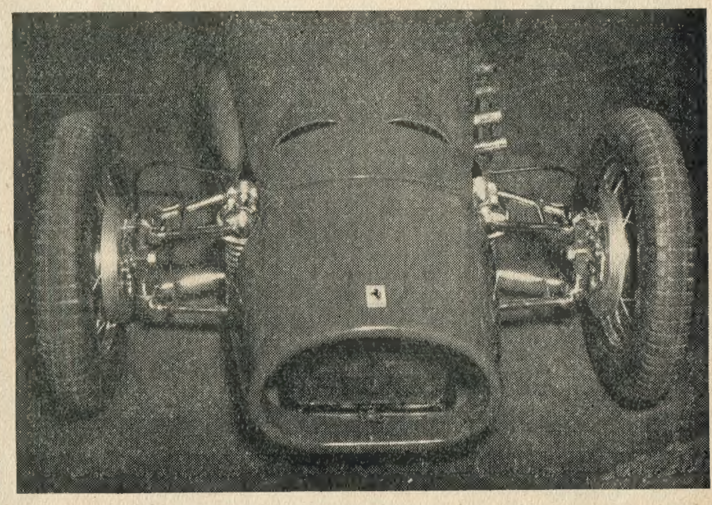
The Pedal Drive

The model is pedal driven, by pedals of the swinging type, pivoted from the upper ends and working bell-cranks through rods passing on either side of the cockpit. These bell-cranks are carried on either end of a cross-shaft situated under the driving seat, the shaft itself running on ball-races and passing through what may be described as a " gear-box." This box contains two chain sprockets, which run free on the shaft and have dogs on their inner faces. Sliding between these, and keyed to the shaft, is a double-ended dog, the lateral movement of which is controlled by the neat little gear lever seen on the right of the cockpit. By this means either sprocket may be locked to the shaft, to take the drive to its appropriate chain wheel on the rear axle, by standard cycle chain. This simple two-speed gear will certainly have a familiar ring to those conversant with the famous old G.N. cycle-car, its offspring the Frazer-Nash, and the older Morgan three-wheelers; but is something of an innovation in a Ferrari !

The rear axle is carried in ball-races in each outer hub, the weight being carried by a sub-frame. A housing, bolted to a plate on this frame, carries a self-aligning ball-race positioned between the two chain-wheels on the rear axle, which acts as a steady bearing, and takes care of the pull of the driving chain on the centre section of the axle. The drive is transmitted through one wheel only, the off-side wheel running free.

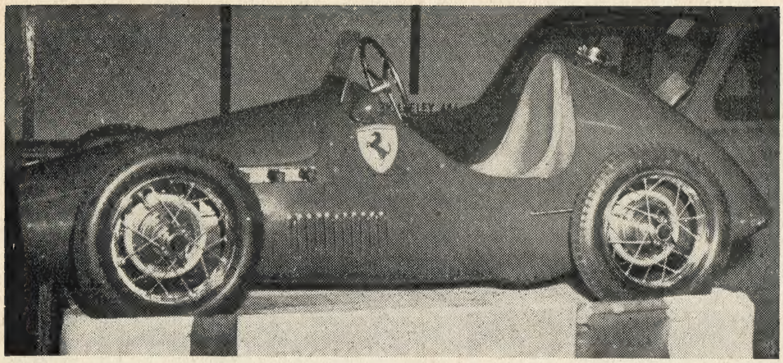
The wheels have 12 in. rims carrying 2¼ in. Dunlop tyres, and are built up on standard cycle hubs and brake-drums, over which handsome aluminium dummy finned casings have been fitted. The brakes have internal expanding shoes, and are operated both by a centrally placed pedal and by the ratchet-fitted hand lever on the driver's left.





Suspension and brake gear are beautifully finished. This view shows the unequal-length wishbones and large coil springs

Left: Cockpit close-up, showing pedals, right-hand gear lever, left-hand parking brake and instrument panel

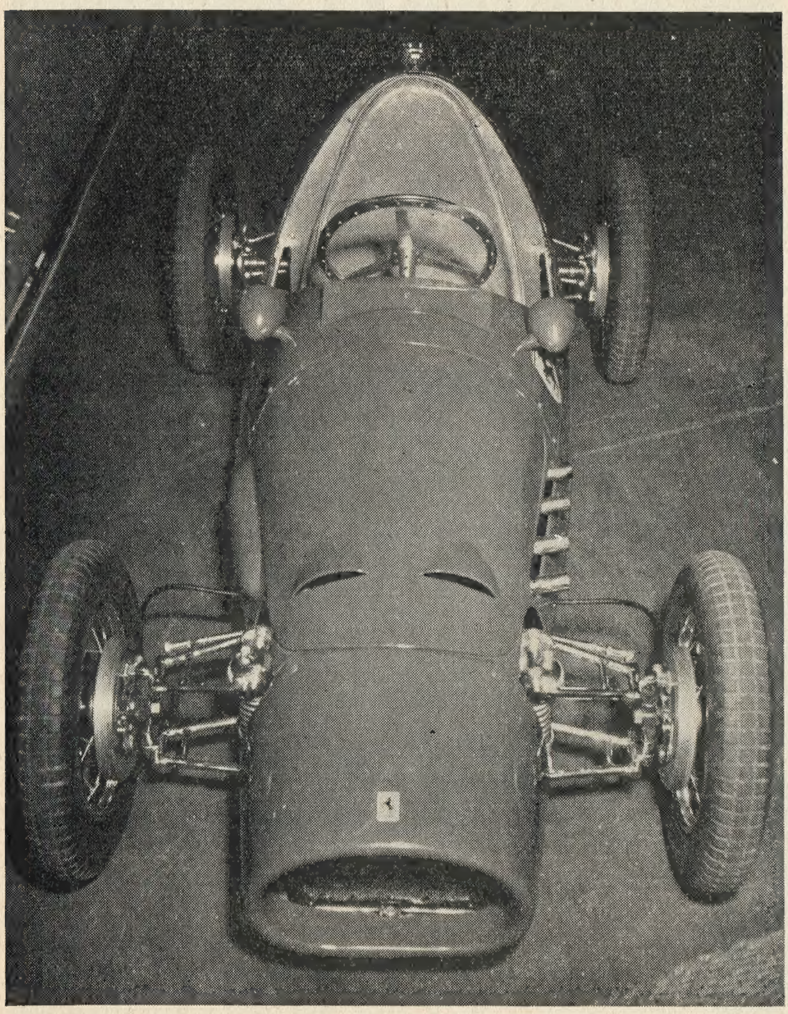


The two-foot-power Ferrari on view in London

All the atmosphere of a Grand Prix car is to be found in the business-like cockpit. A trimly-upholstered bucket seat ensures the driver's comfort, a well lightened dural floor plate is carried between the side-members, and the steering wheel has the full Ferrari flavour. This is cut from dural sheet, with three spokes, capped with a hardwood rim glued to the dural, and fitted with domed-head aluminium rivets to form the authentic hand-grips at 15 deg. intervals round the circumference. The instrument panel holds a cycle speedometer, geared up 2-1, and bevel driven from the rear axle, whilst a dummy revolution counter and an ignition switch add to the air of realism.

Bodywork is of light-gauge aluminium, assembled with aircraft-type fasteners, and is of a standard to do full justice to the workmanship of the chassis. Details include screen, stub exhaust pipes, quick-action filler on the tail and twin streamlined rear-view mirrors of correct pattern. All suspension and steering parts are plated, as are the wheels, and the car is finished in the well-known Italian red.

This model is remarkable by any standards, the very stuff that small boys' dreams are made of. In view of the thrice-lucky owner's tender years, the existing pedal propulsion should serve very well. However, it is impossible not to speculate (knowing "Jonah" as the writer does) on the possibilities of some even more exciting motive power taking its place at some later date. The model weighs 70 lb. all up, and its construction obviously provides a handsome factor of safety. Equipped with a small petrol engine, this charming Petit Prix racer would be an outstanding model indeed!



All external detail visible on the prototype has been incorporated in the model. Note the working front brake cables

Next Week . . .

A MINIATURE ELECTRIC MOTOR

Constructional details of a very small low-voltage motor applicable to many model engineering purposes.

AUTOMATIC CROSS TRAVERSE

"Duplex" describes an electric motor drive for the cross-slide feedscrew of the lathe.

PETROL ENGINES

Machining the air-cooled cylinder-head of the 10 c.c. general-purpose four-stroke, by E. T. Westbury.

A FOUR-WAY TOOLPOST

A practical time-saving fixture for the "E.W." and other 2½-in. lathes

HOT LACQUERING

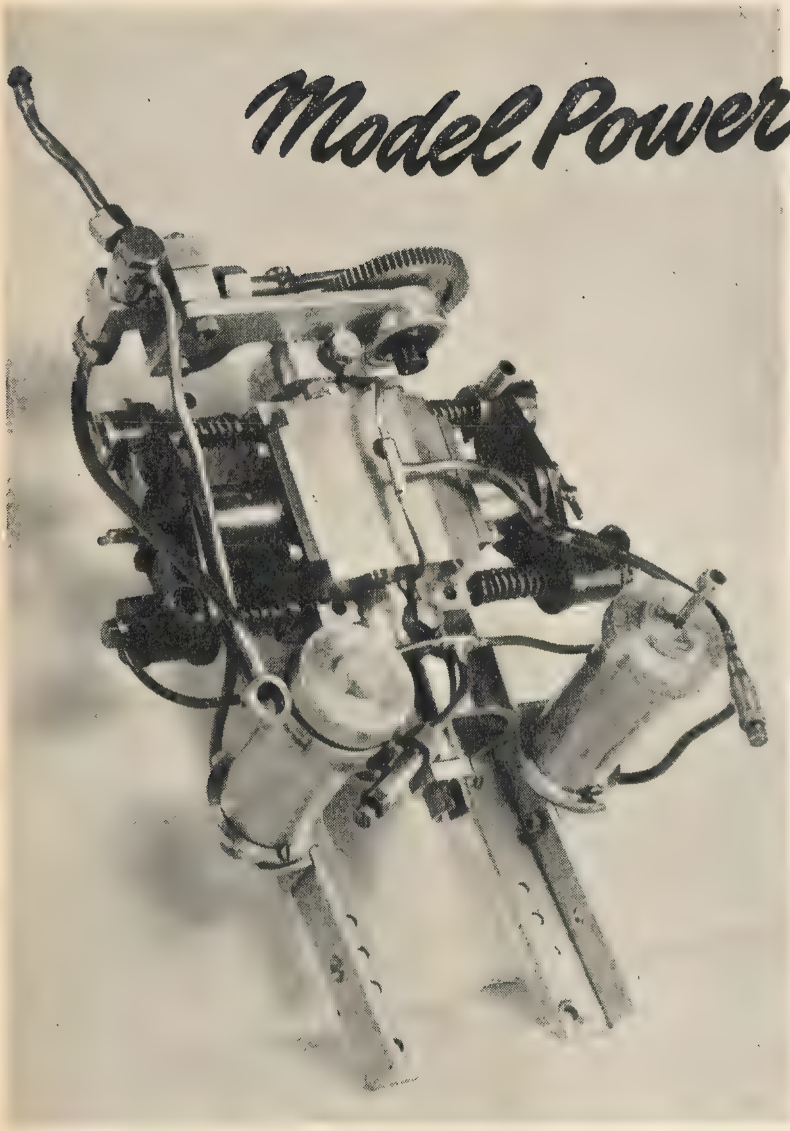
Details of the methods employed in applying the standard tarnish-resisting lacquers for instrument work and ornamental bronze finish.

"NETTA"

The final details for lubricators will be the principal subject for this instalment.

Model Power Boat News

BY MERIDIAN



An opposed twin engine with poppet valves for inlet and exhaust, by Mr. A. Clay

FLASH STEAM— ENGINE PROBLEMS

THE engine department of a racing flash steamer presents a number of problems, all of which are rather difficult to resolve.

Even an experienced flash steam enthusiast has to go through a period of much hard thinking when planning a new engine, since there are several important factors that will contribute towards the ultimate performance. I say " contribute " because a successful flash steamer depends upon the simultaneous and proper functioning of other departments as well. If the pumps, boiler or lamps fail to work well, the best engine in the world will not lift the performance beyond the mediocre.

The main factors in the construction of a successful engine can conveniently be tabulated as follows:—

(1) Design (weight, materials, strength of components, etc.).

(2) Valve gear (type of valve, timing, mechanical efficiency).

(3) Lubrication (clearances, number of pumps, type of oil).

In addition to these main points, there are several minor ones which do not require much discussion, such as: arrangement of pumps and reduction gearing, oil and water pump positioning, and handiness of the layout from the point of view of servicing.

Design

No one has yet claimed to have designed the perfect engine for a flash steamer, and I don't suppose anyone ever will, since engine design is largely a matter of compromise. One example of this is in the matter of weight. There have been built, in the past, engines that were wonderful examples of lightweight design and construction, and which, moreover, put up an excellent contemporary performance. Mr. Grove's twin-cylinder, rotary valve engine is one that springs to mind. The weight of this engine (less pumps) was only 10 oz., but the boat in which it was installed, *Irene III*, had a fine performance for its day, achieving around 30 m.p.h. for single laps, with an average well up in the twenties. Nevertheless, it is questionable whether the engine developed much power in order to attain this speed.

The brake horse power needed to propel a hydroplane at various speeds can be estimated by reference to published figures of b.h.p. for i.c. engines—taking into consideration, of course, the all-on weight of the craft. It is fairly certain that for a boat weighing 7 lb. (the weight of *Irene*), no more than 1/3 h.p. would be developed to reach speeds in the twenties. As speeds increase, however, the power required jumps enormously, and to reach 50 m.p.h. or more, at least 1.5 b.h.p. is wanted for a Class " B " boat.

I am firmly of the opinion that a very lightly-constructed engine such as that mentioned above would be incapable of attaining anything like the latter figure without folding up, this supposing, of course, that enough high-pressure steam was available.

To obtain high power output from small engines means that certain components, at least, must be robustly constructed. A good example of this is the 10 c.c. i.c. engines which made their appearance shortly after the war. All of these engines have one feature in common—a very stiff crankshaft, generally $\frac{1}{2}$ in. diameter, and stout crankcase and bearing arrangements. With the flash steamer, weight is always at a premium, and no effort must be spared to get rid of it wherever possible

Boat	Owner	Slide	Piston	Rotary (Disc)	Rotary (Cyl.)	Semi-rotary	Poppet	No. of Valves
Chatterbox 1 ...	S. H. Clifford ...	1						1
" 2 ...			1					1
" 3 ...			1					1
Sunny Jim 2 ...	A. Norman Thompson		1					1
" " 3 ...						1		1
Tornado 3 ...	A. Martin		1					1
" 4 ...			1					1
" 3 ...	(Later engine) ...		1				1	2
Defiant 3 ...	J. Cruickshank ...		2					2
Sea Devil 3 ...	F. Marsh		1			1		2
Tich	H. Turpin		1					1
Tich Too ...						2		2
Ifit 6	A. Cockman		2					2
" 9				1				1
Vesta 1	F. Jutton				1			1
" 2			1					1
Blitz	G. Lines						2	2
Eega Beva ...	B. Pilliner		1					1
Hero 1	J. Bamford						1	1
" 2			1					1

This table shows the choice of valve-gear for a number of engines installed in flash steamers. (Note that engines *only* are tabulated, as some were installed in more than one boat, i.e., same engine was in *Ifit* Nos. 5, 6, 7.)

—but without sacrificing strength where it is required. This is not too easy to achieve, but much can be done towards this goal by the use of duralumin and similar alloys wherever opportunity allows. The temptation to make components without cheeseparing the weight to a minimum, must be resisted, for every little bit adds up rapidly, and before you know where you are the engine weighs a lot more than anticipated.

One of the best examples of lightweight construction that I can recall was Mr. A. Martin's single-cylinder engine installed in *Tornado* 4 (described in THE MODEL ENGINEER, May 5th, 1938). This engine had a bore and stroke of $\frac{7}{8}$ in., and weighed only 1 lb. 5 oz., complete with pumps. It had several interesting features, including a roller-bearing big-end, ball-bearing eccentric and a dual-pressure oil pump. As far as I know, the engine stood up to its work well, and no mechanical failures occurred, in spite of the fact that speeds around 40 m.p.h. were attained frequently.

In the days of submerged propellers, this ranked as a very high performance.

The design of the engine was of the open type, and this raises the problem of open *versus* enclosed engines. Although an enclosed crankcase offers advantages in the way of strength, trouble may be experienced if it is desired to use ball-races. A certain amount of steam will inevitably pass the piston and condense in the crankcase. The water then causes corrosion of the ball-bearings, and eventual failure. I believe that Mr. F. Jutton is in the habit of removing and thoroughly cleaning and drying the engine of *Vesta* 2 after a day's running, in order to avoid this trouble

One benefit of the enclosed engine should be its cleanliness regarding oil-splashing, but in practice plenty of oil still seems to get about. Oil must be delivered to a flash steam engine in liberal quantities if seizures and breakages are to be avoided, and it is almost impossible to prevent some oil being splashed around the hull. In view of this fact, it is a toss-up which is the better of the two types, but I confess to a leaning towards the open engine for its lighter weight and better accessibility. The dirty habits of the engine might be controlled by installation in a section of the hull lined with very thin aluminium sheet. This would assist cleaning, and prevent oil soaking into the plywood skin (assuming that the hull is a wooden one).

Materials

Superheated steam has an excoriating effect on metals, and obviously cylinders, pistons, valves, etc., must be made of materials that afford good resistance. Good quality cast-iron is very hard to beat, for it is fairly easily machined, and will attain a glass-like finish if kept properly lubricated in action. Crankshafts must be of very strong steel, such as nickel-chrome alloy. Since great difficulty is usually experienced in obtaining these steels in small quantities, the possibility of using old car or lorry half-shafts should not be overlooked. A visit to a breaker's yard may result in an inexpensive buy that will provide material for many crankshafts.

Duralumin has already been mentioned as a useful material, and it is used for connecting-rods, valve actuating gear, etc. If used in conjunction with hardened steel, and fed with oil, it works well as a bearing without the need for bushes.

Cast-bronze is a good material for bearings, and is perhaps the best choice for main bearing bushes if plain bearings are preferred to ball-races.

These observations on materials are necessarily brief, as the subject is a vast one, and would require a long article on its own to discuss properly.

Valve Arrangement

This is an outstanding problem. There are many different types of valve to choose from, for example: Slide, piston, poppet, disc rotary, cylindrical rotary, semi-rotary, and combinations of these. All of the types mentioned have been tried at some time or another by various exponents. I have prepared a table showing the types of valves chosen for a number of very well-known flash steamers. It will instantly be seen that the piston valve predominates and indeed most of the best speeds have been achieved with engines fitted with a piston valve or combination involving a piston valve.

Are we to assume, then, that the piston valve is the best type ? I think that the answer to this is that it is far less troublesome than other valves to get working reasonably well. It has the advantage of being free from side thrusts, although it should be noted that this does not hold true unless the entry and exit ports in the steam chest take the form of an annulus, so that the steam exerts pressure all round the valve when the port is closed.

Slight disadvantages are the rather large frictional area and also the reciprocating weight, which may offer resistance to high-speed working.

The timing of the valve events is all-important in a flash steamer, for in order that the plant shall be capable of operating at high pressure, the engine must be economical of steam. The total admission period should not be more than about 70 deg., and this is not easy to achieve, using conventional eccentric or crank drive for the valve. An ingenious arrangement is used by Messrs. F. Jutton and B. Pilliner on their respective engines. It involves the use

of an off-set crank driven follower-fashion from the main crank-pin, and the effect is to speed up the valve for part of its travel (a variation of Whitworth's quick-return motion). A good port opening and yet a short period is thus attained.

It should be mentioned, for the benefit of beginners, that if it is attempted to obtain short admission periods without the use of cams or some such device as above, the valve must have a long travel in order to ensure a reasonable port opening.

A common distance chosen for valve-travel in non-racing engines is $\frac{3}{16}$ in., and if the admission is reduced to 70 deg., the port opening will be only about 16-thou. If there is any lost motion in the valve actuating gear, this would be reduced still further.

The poppet valve appears to offer advantages for the flash steamer, as it requires no lubrication in the steam-exposed portion, and if seating well, should be free from leakage. Being cam-operated, timing is an easier matter, but care must be taken over the contours of the cam, or bounce may cause trouble.

In practice, poppet-valve engines seem to have proved rather erratic performers. I can recall an engine that was built before the war that could be fitted with alternative heads—poppet or piston valve, and the results were very interesting. The poppet valve gave a higher speed, but for a few laps only, while the piston valve was much steadier, sometimes keeping going for as many as 20 laps. The difference in speed was only a few m.p.h.

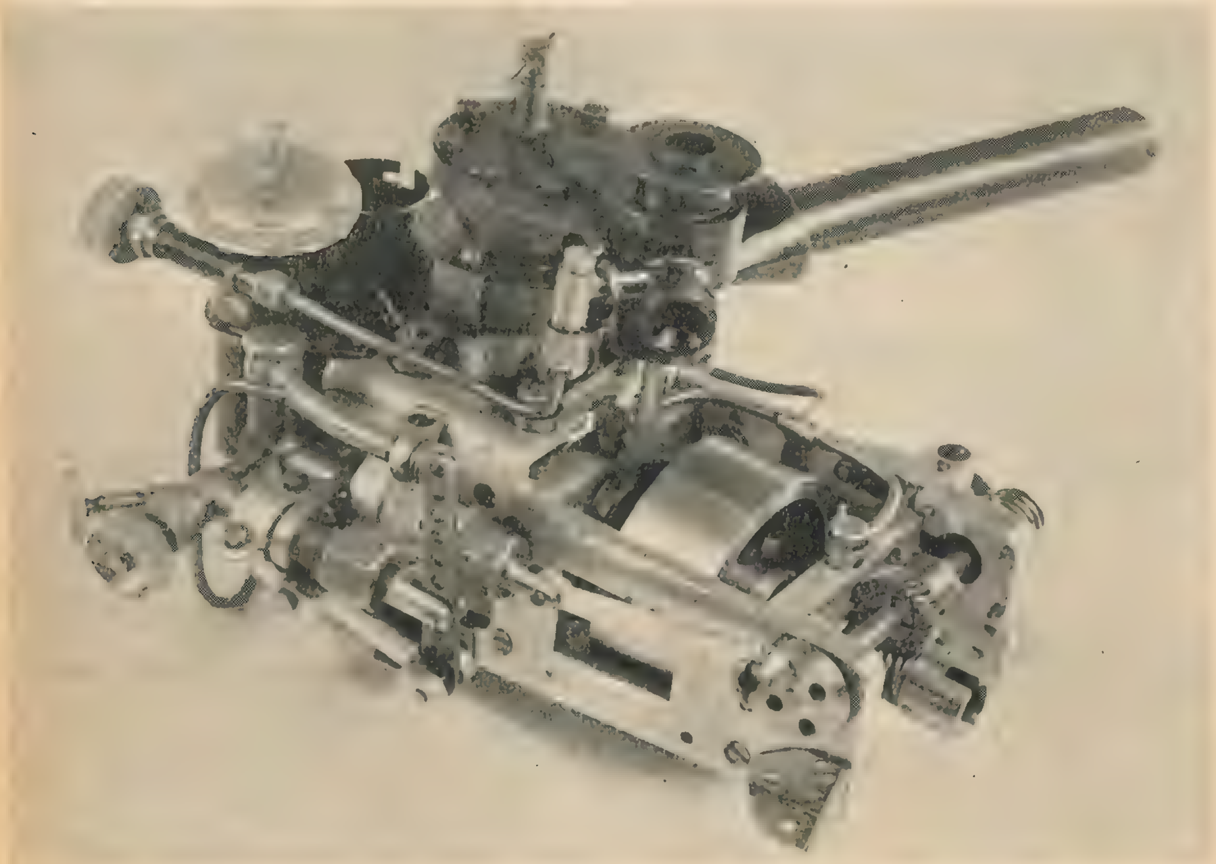
A recently made engine having poppet valves for both inlet and exhaust is illustrated on page 235, and is the work of Mr. A. Clay (Blackheath).

The latest example of a disc-rotary valve engine is installed in A. W. Cockman's *Ifit* 9. The valve is pressure-balanced, but development of the boat is still in the early stages, so that comparison with other types of valve is not quite fair at the moment. The boat has, however, made several good runs at speeds between 40 and 50 m.p.h., qualifying for places in a number of Class "B" events.

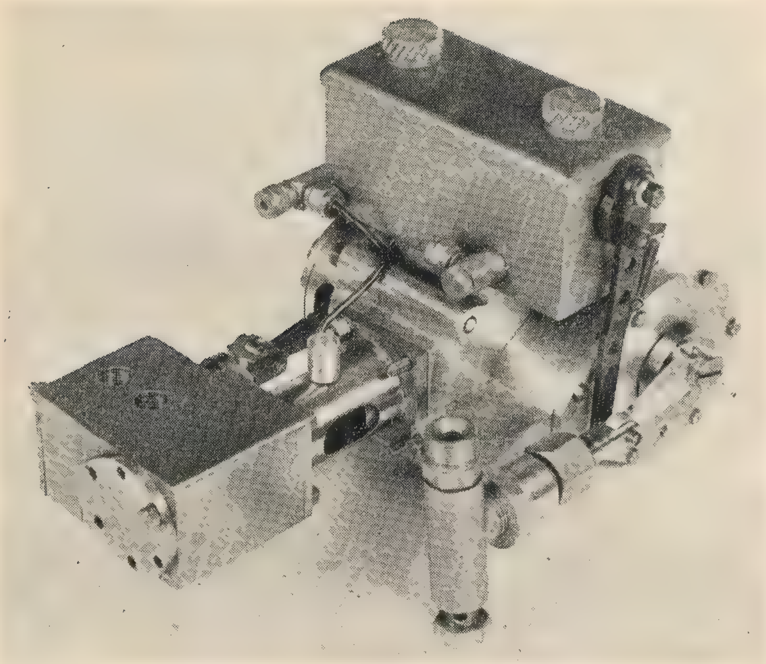
A word now about exhaust arrangements and the snags involved in "getting rid of the steam." If it is desired to control exhaust events with the same valve as the inlet, it will be found that the positioning of the exhaust timing is largely governed by the inlet timing, i.e. the full-open position for exhaust will be 180 deg. later than the full-open point of inlet. (This assumes conventional drive of the valve.) A long compression period cannot be avoided, unless the exhaust commences very early, which is rather a debatable feature. For this reason, two separate valves are sometimes favoured—one for inlet and one for exhaust. In addition, there may be exhaust ports cut in the cylinder wall, uncovered by the piston at the bottom of its stroke, although this feature has been questioned by several exponents who maintain that it tends to break the oil film lubricating the cylinder wall.

Results provided by engines tried with and without these additional ports seem to prove these contentions; it should be noted, however, that the engines concerned had adequate exhaust arrangements *via* the main or auxiliary valve, or valves.

It cannot be over-emphasised that engine timing is a crucial factor in flash steam plant performance. In the realm of the small locomotive, friend "L.B.S.C." has always advocated good timing: Early admission (port cracking open at T.D.C.), early cut-off, and a free exhaust. These ideas have paid divi-



Mr. A. Rayman's single-cylinder piston-valve engine, with feed and oil pumps



A horizontal double-acting engine with mechanical ratchet lubricator, by Mr. Rayman

dends, yet it must be borne in mind that a locomotive with 3-in. drivers does less than 1,000 r.p.m. during normal running. The racing hydroplane needs propeller revs. of 15 times this figure if the record speeds are to be approached!

This comparison will, I hope emphasise the need for even more advanced timing ideas to get the greatest possible efficiency. In practice, as much as 22 deg. of advance on the inlet valve has been used (*Ifit* 6) and I am satisfied that very high speed engines will work with even more than this, although it may not be necessary if the valve can be operated by a cam. The recent experiments of Mr. J. Bamford with a piston-operated disc valve, which gives a theoretical advance of exactly half the total admission period, illustrates that, apparently, peculiar timing can work well in practice. It should be noted that the use of a desaxé position of the crankshaft should help a little for this type of valve operation.

Lubrication and Clearances

Oil is the life-blood of a flash steam engine, for without adequate supply to all highly-stressed bearings and to steam-exposed working parts, seizure or breakage is certain to occur.

Steam cylinder oil is much favoured for the lubrication of the valve and cylinders, since it is specially blended to stand up to high temperatures. It rather resembles thick black treacle in the cold state, and this may cause a little trouble when starting up the plant, by the failure of the oil pump valves to work.

The usual way of meeting this is to warm up the oil tank by a loop of tubing led from the exhaust system, or the tank can be heated up by the application of an external flame! Once the plant is operating, there will be enough heat from the engine to keep the oil fluid.

When using proper cylinder oil, valve and piston clearance may require to be in the region of thous. rather than tenths of a thou., although this is a matter for experiment on individual engines.

At least one well-known boat gave some of its best runs when the valve had worn decidedly leaky, and this feature may be due to oil drag.

Beginners sometimes use motor gear oil for cylinder lubrication, but it is unsuitable for high-temperature working and must be avoided. Motor oils of the grade intended for motor-cycle engines, however, have been used with success, and with fine clearances in both piston and valve. The notable example was Mr. A. Martin's *Tornado* 4, which operated on Essolube "Racer" oil.

A rather unusual feature has been tried on at least two notable steam racing boats—Mike Succarde's steamer in the U.S.A., and the Australian boat *Sunbeam* just prior to the war. This is the water-cooled valve chest, which idea sounds rather strange, considering the difficulties involved in the heating department of a flash steamer. I think that the cooling effect is a local one only, and may be just enough to prevent the high superheat carbonising the oil. Unfortunately, I have no information as to the grade of oil used in either of the boats mentioned, but I strongly suspect that a low-viscosity oil was favoured.

Turning to some other points that must be oiled, the big-end is perhaps the most important, and force feed is essential, if the bearing is a plain one. Similarly with the main bearings, and drip feeds should be used to supply oil to valve gear joints, etc., in fact, everywhere possible to reduce friction.

If heavy steam cylinder oil is used, it will not be suitable for bearing lubrication, and it is usual to have two oil tanks in this case. Two oil pumps are necessary—one for feeding the cylinder oil and one for a lighter oil fed to the mains and big-end.

Non-racing Engines

As mentioned in the first article in this short series, almost any engine can be operated on "flash," but there are one or two provisos. For example, engines that are constructed of unsuitable materials should not be used. Brass cylinders, valve-chests, valves and pistons will wear very rapidly, since some superheat is difficult to avoid even with a low-pressure flash steam boiler. Good quality bronze, gunmetal or cast-iron will work well, provided that adequate lubrication is available.

A suitable engine for non-racing work is the Stuart No. 10. Castings are available for this engine, which has a cast-iron cylinder and valve-chest, but the piston and valve should be replaced by bronze or gunmetal for best results.

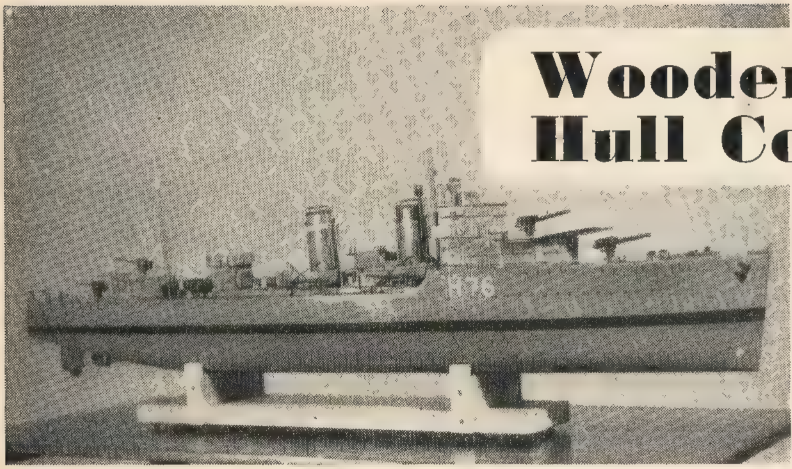
The timing of any engine intended for a flash plant should make for reasonable steam economy, although the extremes required by racing engines are not necessary. Timing that admits steam all the way down the stroke will *not* prove successful, and the cut-off should be arranged as soon after ½-stroke as possible.

Reasonable timing will be facilitated if ¼ in. travel is used for the valve, instead of the shorter travels in common use.

Steam passages should permit the steam to get in and out of the cylinder without "wire-drawing," and the exhaust must also be as free as possible. The foregoing applies, of course, to engines with slide or piston valves, but engines of the poppet-valve type such as the "Sparten" design should be O.K. without modification, since the timing of the poppet valve makes for steam economy.

Lubrication of the non-racing engine, from the point of view of displacement lubricators versus oil pumps, I have already touched upon in a previous article, but in addition, I would recommend the use of drip feeds, at least to the big-end and mains. A flash steam cruising boat will run for as long as

(*Continued on page* 240)



Wooden Hull Construction

A SIMPLE METHOD

By L G. Warner

The finished model destroyer, photographed by Roger Bradley

NO originality is claimed for this method of making a boat, neither is it applicable to all types of ships. It will, however, be found a cheap and comparatively easy way, suitable for hulls which have a fairly square section. Of course, we know a destroyer has a very slim figure and its lines are very graceful, but in a small model such as this, the cross sections have to be fairly rectangular to obtain sufficient displacement. In any case, the above-water appearance can still look very realistic; in fact, a glance at the photograph will show that the underwater shape does not look too bad either.

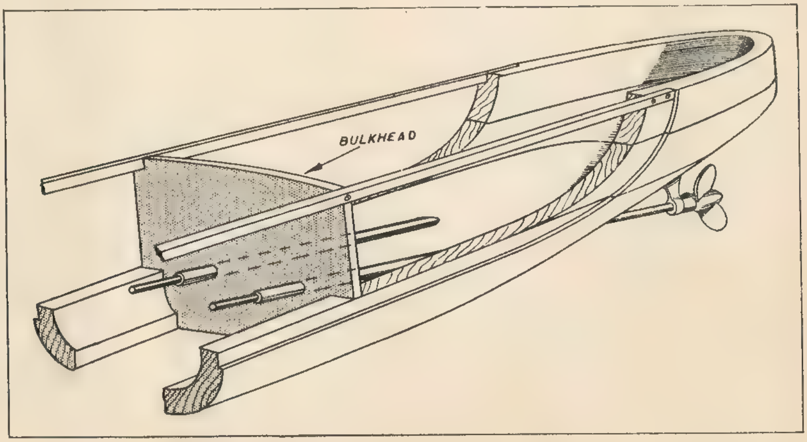
Such masters as Mr. Norman Ough can produce true to scale hulls, but this method is for the less skilled worker. The design is that of the destroyer H.M.S. *Fury*, drawings of which are obtainable from the "M.E." offices. No templates were used when the hull was built. It was just made to look right by eye. The leading dimensions are length 35 in., beam 4 in. and depth 3 in.

First of all, the question of material. The hull was made from some off-cuts of yellow pine and the top door panel of an old piano. Happening to be present when some "bombed" timber was being sawn up, it was noticed that a number of finely sawn lengths of this pine about 4 in. wide and $\frac{1}{8}$ in. thick were being discarded. Some of these were readily given to the writer and really started the idea of using them for boat building. Some more lengths 4 in. wide and 1 in. thick were also obtained at the same time. All was now ready for starting work.

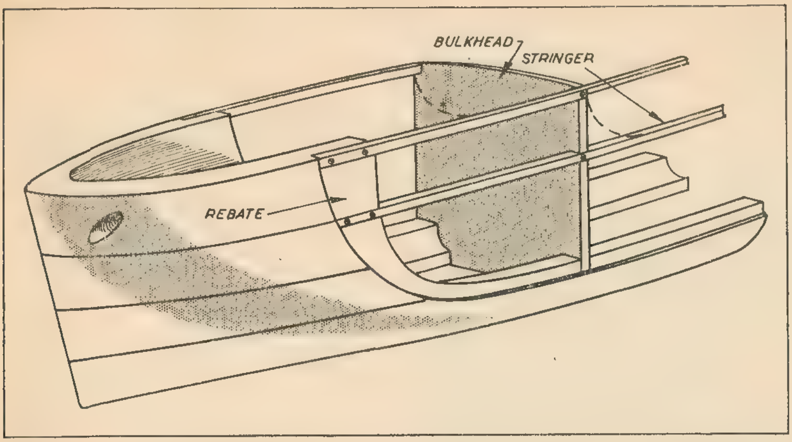
The baseboard was taken in hand first, cut to shape, the bow and stern built up in layers, the whole being glued up with "Croid" and clamped. While this was drying, the deck was prepared from the previously mentioned old piano panel. It was first planed down to $\frac{1}{8}$ in. thick and then cut to the shape of the deck, all in one piece from stem to stern. An opening was cut amidships for access to the interior. Finally it was sawn across at the fo'c'sle break. Two clean straight-grained pieces of the $\frac{1}{8}$ in. pine were now selected and planed down to 3/32 in. thickness. By this time the main structure was dry and ready for rough shaping at bow and stern: the bilges were rounded off as well. Two bulkheads were cut from the old panel and fitted into slots and a long opening cut in the bottom of the hull between them for lightness. A triangular piece was also cut out ahead of the forward bulkhead for the same reason. Two stringers, $\frac{3}{16}$ in. square, obtained from the beading in the old piano panel, were let into the shaped bow, slotted into the bulkhead and let into the stern-piece. Two shorter ones were fitted from the bow to the forward bulkhead.

A rebate 3/32 in. deep was next cut each side ready to receive the prepared side-pieces. A piece of cartridge paper pinned on and rubbed round gave the exact shape of each panel. It is advisable to take a rubbing of each side in case they are not quite the same. Paste them on the wood and cut to shape, but leave a little bit extra for the final fitting. The sides are secured by No. 0 $\times$ $\frac{1}{4}$ or $\frac{3}{8}$ in. brass countersunk screws spaced $1\frac{1}{2}$ in. apart. They may be bedded in with Croid or white lead whichever you prefer. The deck was fitted last, also screwed and glued. The hull was now complete and only required fairing up with a small plane and spokeshave. It was, of course, finally finished off with glass-paper. A shaped block being used for the flare. The drawings are almost self-explanatory. The complete hull weighed $1\frac{1}{4}$ lb. I have refrained from giving exact dimensions, as I wished to stress the method of building the hull rather than a description of any particular one. I forgot to mention that two panels will have to be fitted in the lightening openings in the bottom.

The next problem was boring for the propeller shafts. They are 1 in. apart, just inside the stern bulkhead and 2 in. apart at the propellers. Mark out the centre-lines of the shafts on the bottom of the hull and screw on a small piece of wood where the stern tubes will enter. Also another piece where the propellers will be, with two holes 2 in. apart inclined at the correct angle. Now make a long drill $\frac{3}{16}$ in. dia. This can



Stern view, showing propeller shafts



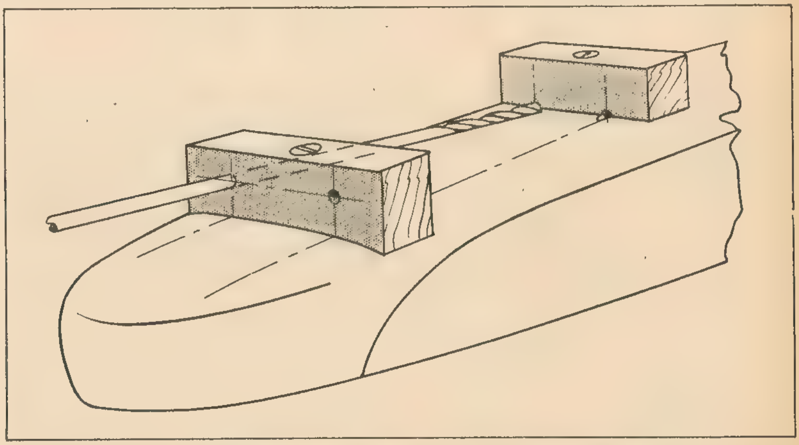
tapped through each hole into the wood. The strip is then removed and the centre of the punched rings picked out with the point of a penknife. A piece of transparent celluloid, old film, had previously been prepared by painting one side of it green. A number of discs were punched out with the 5/32 in. punch, and stuck in the depressions, paint side inside. Of course, this has to be done before the final varnishing is undertaken.

Painting the identification letters and numbers seemed to offer some difficulty, so this was overcome by cutting them out of white paper. They were stuck on the hull and then carefully painted over.

As an afterthought $\frac{1}{16}$ in. plywood could be used for the side panels and would probably make a stronger job.

Bow view of frame

Right: How to drill propeller shafts



easily be made by shouldering down an ordinary twist drill and soldering it into the end of a piece of silver-steel. Make small indents in the first block at the centre-lines to give the drill a start. Pass the long drill through the stern block and carefully drill through to the interior.. In my own case the holes came out exactly right and two 1 in. Meccano gears were used to connect the two shafts. As the shafts are out of parallel it allows the gears to be adjusted for mesh. Of course, under these conditions they cannot mesh perfectly but this will not matter on a small model such as this. The stern tubes are $\frac{3}{16}$ in. brass bushed at each end for 3/32 in. shafts. No provision is made for adjusting the rudder. Small boats of this size always seem to be erratic and whatever adjustments are made they rarely keep a straight course. Under the circumstances, it seems better to fix the rudder and give it a permanent set in whichever direction gives the best results.

Now comes the painting. All cracks, screws heads and digs were filled with Brummer stopping, followed by two or three coats of french polish brushed on. After rubbing down, several coats of flat battleship grey were put on with more rubbing down between each coat. A strip of cellophane tape was next stuck on above the water line and the lower part of the hull painted with anti-fouling coloured paint. The black boot topping was made by sticking on two strips of tape $\frac{3}{8}$ in. apart and painting the intervening space. When dry the tape is stripped off, leaving a beautifully clean and straight line. Two coats of varnish complete the job.

Many model ships seem to be spoiled by portholes that look too prominent, so special attention was paid to this part of the job. They are necessary to make the model look right. The method used was as follows :—A 12 in. Meccano strip was used as a spacing gauge. A 5/32 in. hollow punch was then lightly

MODEL POWER BOAT NEWS

(*Continued from page* 238)

the lamp lasts, and if oil is only doled out to the bearings occasionally from an oil can, the bearings mentioned will look pretty sick in a short while.

I sincerely hope that this recitation of flash steam troubles will not frighten off any readers who may have been thinking of building a flash steamer, but I maintain that it is better to have some idea of the snags beforehand rather than find them out only after much time and hard work.

I would also point out that only the more obvious problems have been discussed here, and then only those concerning the plant. The problem of hulls, weight distribution, and its relation to surface propellers, also loom ahead of the would-be flash steam exponent.

For the beginner who would like to try his hand, I would urge—build a cruising flash steam plant first, and learn as much as possible from it. Do not expect to build a record-breaker first time, since all the most successful boats have been the results of earlier experiment. Flash steam offers a challenge that can be overcome by good workmanship, design, and tenacity of purpose.

I am still firmly of the opinion that the possibilities of the flash steamer have not yet been exploited to finality, and that it is still capable of challenging the fastest i.c.-engined boats for speed boat honours. Judging by readers' letters that appear in the correspondence columns from time to time, there is much interest in the subject of flash steam, but a lot of this interest is purely theoretical, and the practical exponents are few and far between. I hope that these notes on the subject will help to stimulate thought and discussion, and perhaps even persuade some readers to build a flash steamer.

In conclusion, I must say that I make no claim that the opinions expressed are infallibly correct, but they are based on my own observations and experience, and also that of other power boat colleagues who have tried to harness the latent power of "flash steam."

An Aberdeen Exhibition

THE annual exhibition of the Aberdeen Model Engineering Society held in the Music Hall, Aberdeen, was opened by Mr. A. G. Booth the City Engineer. The moving spirit behind the exhibition was the honorary secretary of the society, Mr. A. W. Gauld whose encouragement and able assistance are a constant inspiration throughout the year.

As usual the display drew a large audience of both modelling and engineering enthusiasts, the attendance for three days being over 1,500.

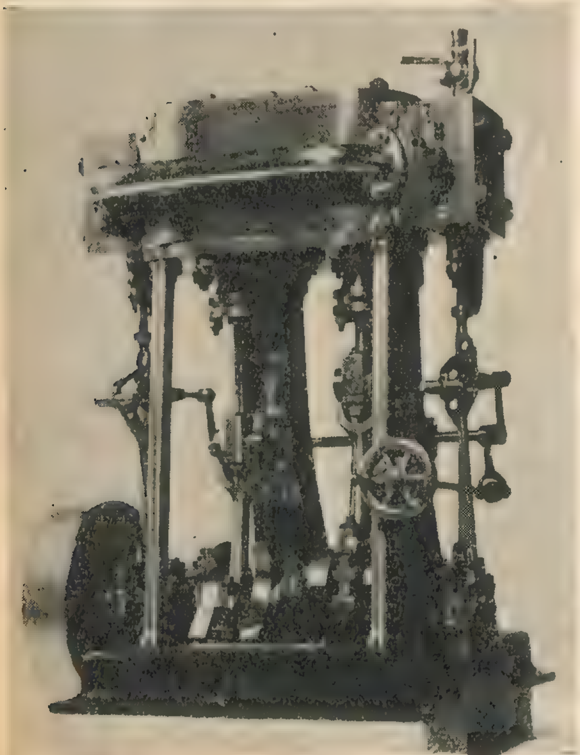
The 78 exhibits were displayed on 16 tables in two rooms, and included engineering tools made by members as well as models of steam, traction and railway engines, boats, Meccano models and a model railway.

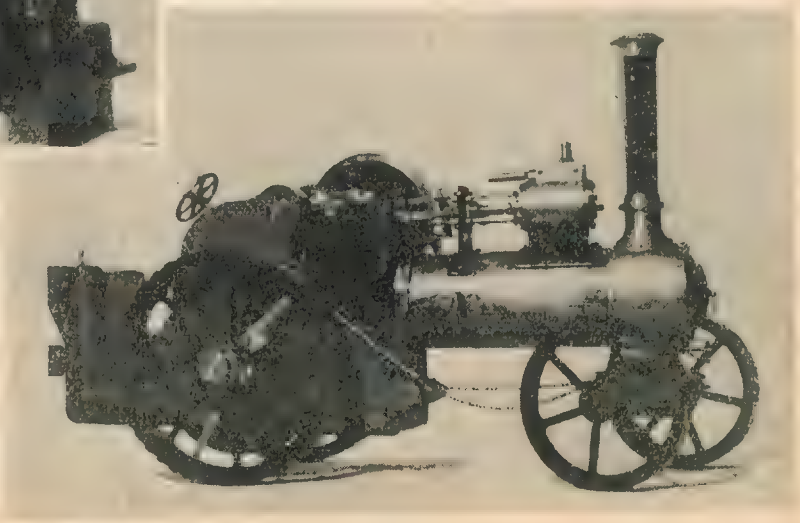
One of the most interesting sections was a collection of models of old steam engines dating from 1835. Another special attraction was a display of working models of various types of engines, particularly a 1¼-in. scale traction engine.

Awards were given as follows:—

Silver Cup to Mr. N. Watson for his 3½-in. gauge railway engine *Heilan' Lassie*. This model, which took three years to build, has passed all steam tests, although it has never actually run on a track. *Bronze Medallion*, presented by Aberdeen Town Council for the most outstanding model of local interest, was won by Mr. S. Reid for his Meccano model of a horse-drawn tram. *1st Class Award* (*Boat Section*) to Mr. J. Main for his model of the Aberdeen Daxford Engine Trawler *Ben Lui*. *1st Class Award* (*Steam Engine Section*) to Mr. A. W. Gauld for his model of a vertical reversing engine designed and constructed by James Pollock 1865. The model was built from the front page illustration of THE MODEL ENGINEER, May, 1947. The confectioner's replica of the model was raffled at the end of the exhibition. *1st Class Award* (*Tool Section*) to Mr. G. Walker for his lathe, including chuck, which was constructed entirely from scrap.

A radio-controlled motor launch built by Mr. L. Mackie, and awarded last year's bronze medallion, and a model of a compound engine loaned for the exhibition by Messrs. Sparks Ltd., King Street, Aberdeen, attracted much attention.





Top of page: This model of the Aberdeen Daxford Engine Trawler *Ben Lui*, by Mr. J. Main, won a first-class award in the Boat Section

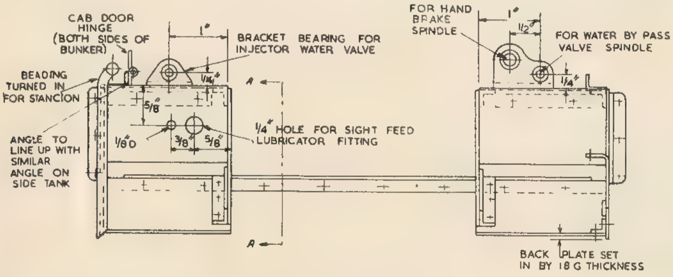
Centre: The model compound engine loaned by Sparks Ltd., King Street, Aberdeen

Right: A 1¼-in. scale traction engine, well advanced towards completion. It was one of a number of models being activated by compressed air

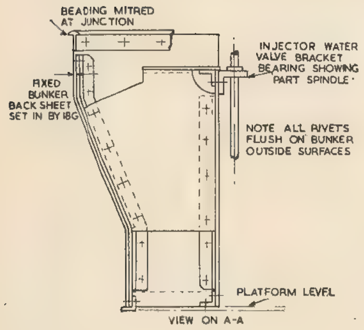
TWIN SISTERS

By J. I. Austen-Walton

THE drawings that accompany this instalment, deal with the fixed and removable section of the bunker, an arrangement that permits of driving access and a fair view of all the fittings and controls. When I first ran " Twin," an inflexible spine prevented my seeing the pressure gauge without sliding back a long way on the driving truck, so the cab roof was removed as well. Apart from the gauge, which is quite high up on the front spectacle plate, all the other controls came readily to hand, and driving was an " arm chair " performance that had much to commend it. Firing was no longer a business of stretching over a long tender, but seeing *into* the fire was another point in favour of being a little further away. It was then that I decided to do a number of jobs in one, and made up a sort of driving truck tender for coal, water, and somewhere to perch the fire-irons. With this new and most useful accessory bolted in place, the driving position was still at comfortably close quarters, and I could, if necessary, see almost up to the front tube plate.



Plan view of fixed bunker

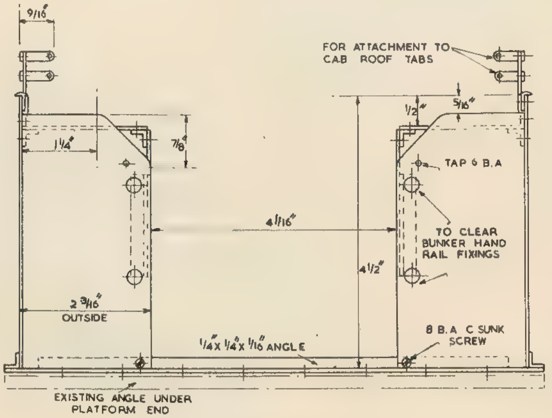


It may be that I'm not a very good driver, for my first few runs were marred by an overfilled firebox, and the consequent fall of steam pressure until the fire had pulled through. The firebox is very small, and the one or two teaspoonfuls of coal that appeared to have everlasting burning qualities as lap followed lap, seemed too good to be true, but the fact remains that this little job is remarkably economical. Even one distinguished visiting passenger, leaned forward and asked, rather anxiously: " When *are* you going to put some coal on ? " For which I had no ready answer. I had, by then, become accustomed to her economy. Whilst on the subject of economy, and looking back through some of my recent comments on running in general, I see I made notes on a water consumption " that was phenomenal,"—a statement that brought no immediate comment, strange to relate, but which may now be corrected. " Water consumption amazingly low," would have been a better description, and with the additional water space in the extra tender, one may cruise around nearly all the evening on the initial filling. And now, let us turn to the works section.

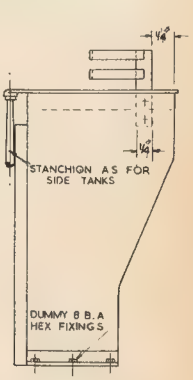
The Fixed Bunker

This is really made up in two separate and distinct sections, bolted down to the platforms and tied across their backs by a single strip of angle. This angle sits " upright " across the extreme back edge of the platform ends, and provides (*a*) a standing edge for the attachment of the sunk-in back sheets of the two bunker units, and (*b*) a location edge fillet over which the removable bunker section clips itself when in place. By making the fixed bunkers as described, it allows such fittings as the sight-feed lubricator, cab doors, and parts of the floor to be left in place at all times, and with pipe connections securely and neatly made in the case of the lubricator, injector water-valve, water by-pass valve, to say nothing of the hand brake spindle. Hand access is very good indeed, and burnt fingers quite unnecessary. There were one or two parts that needed careful arrangement; for example, the coal rails on the bunker at the point where the removable section joins the fixed section. This has been settled by allowing the free, unfixed ends to remain on the removable part, which must, of course, be taken away when driving. This applies to the more ornamental but strictly correct details as well, namely, the tool locker and the sliding bunker door below it.

The full opening windows are a bit fiddling to make and might well be left as fixed rings in the case of " Minor." The " glazing " in either case, might be Perspex or a lesser cellulose acetate sheet in the case of the back windows. I have used 24-gauge Perspex with great success for all the windows, including those in the front spectacle plate where it gets quite hot. There has never been any sign of the windows buckling, sagging or becoming dis-

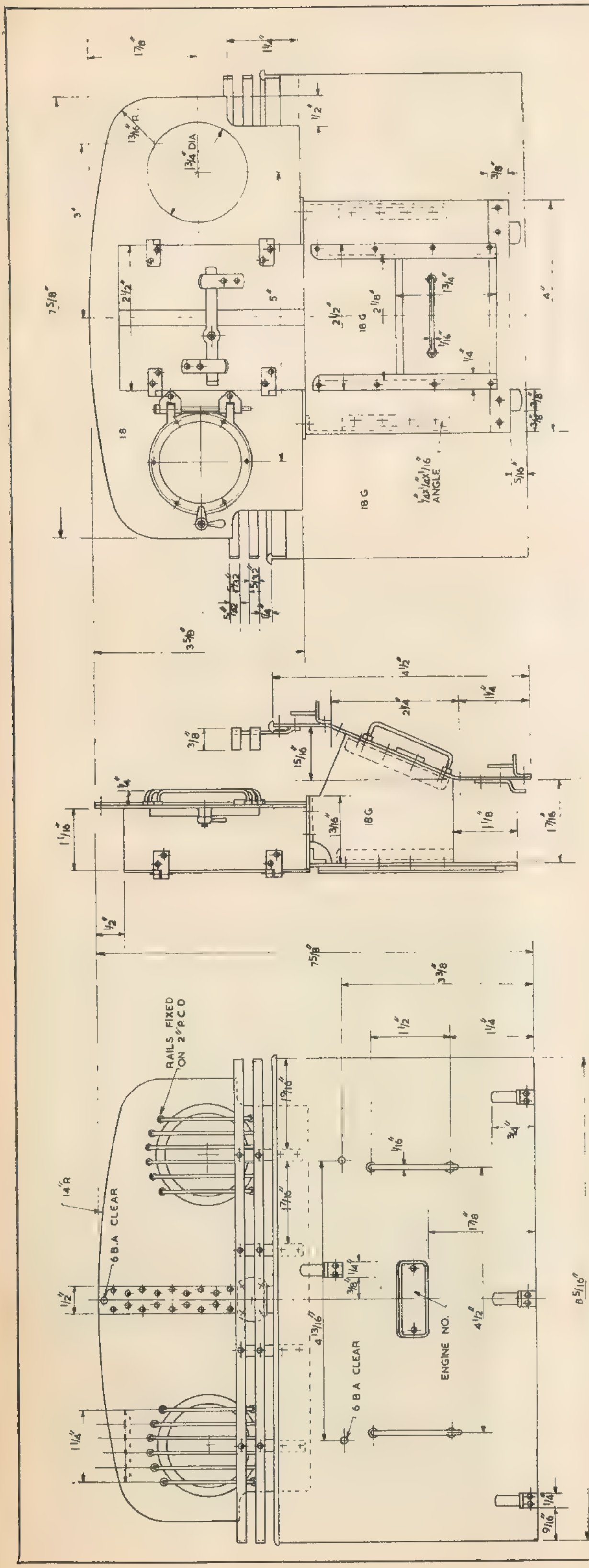


Fixed bunker, rear view



Side view of left-hand fixed bunker

Continued from page 159, *February* 10, 1955.



Front of bunker

Removable back bunker, rear view

coloured. The drawing shows the main dimensions for the fixed bunker, but not all the internal angle fastenings are shown; this was done to keep things as clear as possible, and to prevent a mass of confusing dotted lines running about mysteriously. Regard the fixed bunkers as simple boxes, angled together where necessary, and provided with similar angle "feet" inside, to provide a floor fixing. The important point to watch is the setting in of the back sheet. You will see that the side fixing angle is set to the right contour, and fixed in from the edge to accommodate two thicknesses of 18-gauge sheet. One of these thicknesses is the fixed back, and the other, the main back sheet of the removable bunker. The inside faces of the fixed bunkers, take the form of strengthening gussets, which are, in fact, on the prototype. All we have done in the case of the removable section, is to repeat these gussets and make them perform the task of tying the remaining bits together. With everything in place, not only are the joins quite invisible (that's up to you, and your workmanship, really) but it is all exactly as it is in full size.

The fronts of the fixed bunker sections both carry brackets. The left-hand bracket is single, and carries the vertical spindle to operate the injector water feed-valve. The right-hand bracket (described on page 795, December 18th, 1952 provides a bearing for the hand-brake shaft. There is also a large hole to take the lubricator on the left-hand bunker platform, and a small hole alongside to allow the pipe from its top banjo connection to run through, down and along to the main connection that lies between the cylinders. The sight-feed valve screws up underneath the platform, and should be fixed so that the valve handle points to the back.

The drawing shows a special section used for the top edge beading—the same as that shown for the side tanks. This is the correct form, with its half-round part lying flat on the top edge, and its vertical flange offset to allow for the thickness of the metal to which it is riveted. This was all machined up from a suitable section of brass curtain rail found at Woolworths, and a special rig made for holding lengths of about 14 in. for machining the half-round top with a concave milling cutter. Maybe it isn't worth the trouble, and the more usual half-round brass beading will be used, riveted along the top side edge.

The Removable Bunker

This comprises the following parts: The spectacle plate, the main back sheet, shaped to match the fixed bunkers, the tool locker, the platform continuation, and the coal bunker complete with its sliding door. In addition, there are the windows and other trimmings. First of all, make up the back sheet and fit it to match up with the fixed bunkers in place. Cut out the spectacle plate, and another to the same profile but excluding the cutaway portions for the rail attachment tabs that fit in the cab roof. This other plate will be needed for the front spectacle plate, but in which the windows will be arranged differently, so leave it without any window openings. Now make the coal bunker front plate with an arch cut out approximately as shown on the drawing. The door slides are made up "sandwich" style, the intermediate strips being of heavier gauge than 18, so that that door will slide freely. The door is a simple plate, reinforced top and bottom by pieces of half-round beading, cut away where the door enters the slides. The lifting handle will need a fixing that is quite flush at the back, and silver-soldering this in place is the best solution. On top of the bunker plate is a platform or shelf which should be cut and shaped so that it sits comfortably but not tightly between

the fixed bunker shelves, and on the tiny ledges left by the junction of top and side plates. This may be fixed to the bunker plate by an angle inside. Now make up the tool locker with its two doors to meet in the middle, and thin cover-strip riveted or soldered to one of them. The cross-bar lock and catch strips should need no explanation. The completed tool locker should now be fixed to the platform, and the main side gussets, cut out and tried in position with the back sheet in place and the tool locker, platform and coal bunker unit positioned correctly. Make the gussets full to start with, easing them back until all relative positions are established. When this has been done, make up and fit the attachment angles, fix them to the gussets, and with a long scriber, mark off through drilled holes on to the inside of the back sheet. A couple of soft rivets should suffice for "proving" the unit, after which further drilling and riveting can be done. Prior to the final assembly, one would naturally drill other holes for handles, number plate, and have already fixed such items as lamp brackets and coal rails, their free ends also matched up with those stopping short half-way across the vertical attachment strips on the fixed bunkers.

Spectacle Plate

After cutting out to profile and trimming away for the attachment tabs that fix to the cab roof, the window openings should be made. You will notice a vertical strap, riveted on to the back face of the spectacle plate, and embodying a blank pad very near its lower extremity. This is pure ornamentation, based truthfully on features of the prototype, and may be omitted by those who detest accuracy. It is, in fact, a butt-strap that joins the two half-sheets together, and has a removable pad in line with the regulator. This (in full size) permits of the removal of the long regulator-rod when service or shopping is in progress. We have no long regulator-rod, so an accurate ornament it must remain. The coal-rails over the windows are a "must" if the engine is to preserve its good looks, and as it entails little more than a couple of hours work with some 20-gauge brass wire and a few tiny brass collars turned up and parted off a scrap of $\frac{1}{8}$-in. brass rod, it becomes almost an armchair job. Even soft-soldering should be enough for fixing the guards, after which the windows may be fitted.

The finished spectacle plate is fixed to the tool locker by four bolts through from the inside. If these go through the locker attachment angles as well, the fixing will be so much the better. From this point, the front spectacle plate, although not yet given in detail, may be furthered by cutting it away to saddle neatly over the firebox, and adjusted so that it comes exactly in line and height with the rear spectacle plate; take some care with this, or the cab roof will never look anything but awful. A further neatening of the front plate is brought about by the fitting of a very thin angle fillet at the junction of the plate with the firebox lagging. This is a job that very few builders care about, and if carried out in anything but the thinnest, "made-up" copper sheet, folded to angle form, it can drive you mad. On leg of the angle may be left quite short—$\frac{1}{16}$ in. is quite enough—and suffices for soldering or silver-soldering to the sheet itself. The flat of the angle that follows the firebox contour should be about $\frac{3}{16}$ in. or a shade over.

The removable bunker unit is also provided with three fixing holes. Two tapped holes are shown on the back sheets of the fixed bunkers, and there is one to come in the roof angle of the cab itself. I made up three very small stainless-steel knurled screws for this job, but the back always fitted so snugly that they were never needed; I think I've lost them now !

Finish

Everything in dull or egg-shell black except the inside face of the spectacle plate. This should be of a stone colour, and if you are a "spray-on" merchant, this operation may be carried out without masking or other bothers, simply by painting or spraying before attaching to the tool locker.

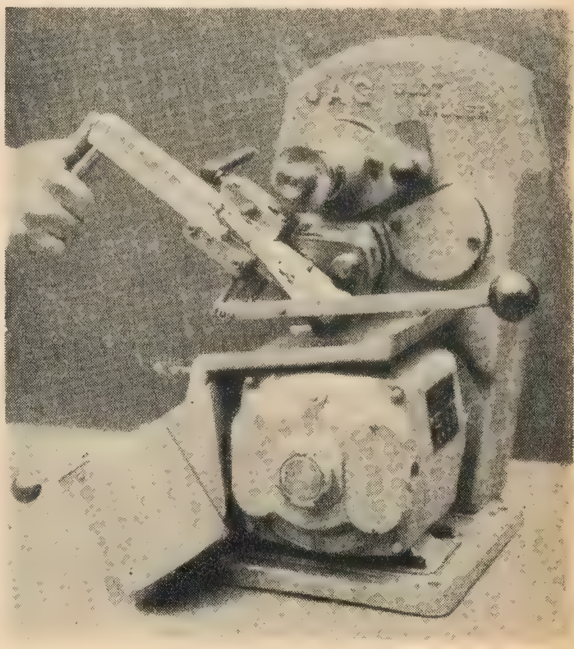
The engine number plate was shown, full size, but in reverse (for the benefit of those who wished to take advantage of the photo-etched product) in Issue No. 2734, October 15th, 1953. I urge all those who are interested enough to want more exact bunker details, to send for a copy of the drawing which shows everything full size and to scale. The cost is remarkably nominal.

(To be continued)

A Simple Slot-milling Machine

An interesting light machine capable of dealing with simple milling operations on small parts has been introduced by Jag Machinery Co., 3, Lynwood Grove, Heaton Chapel, Stockport. It embodies a headstock with three-speed vee-belt and gear drive to the mandrel which carries the cutter, and a workholder capable of sliding and pivotal movement for traversing and plunge cuts respectively. Two alternative methods of securing the work are provided namely, a machine vice and a collet holder, but special jigs can be supplied for holding work of various shapes. Standard equipment includes swarf chute, chip tray, and totally enclosed surface-cooled motor, and extras include combined stand and accessory cabinet, coolant pump, and reversing starter.

One of the most useful functions of this machine is the cutting of keyways in shafts of any length, but it can also be adapted to many other operations, such as screw-slotting, fluting, rebating, etc., for which purpose it will compare in efficiency with much more elaborate machines. The standard speeds are 87, 180 and 320 r.p.m., and the work-holder has a lateral adjustment of $\frac{3}{4}$ in. and a cross traverse of $4\frac{1}{2}$ in. Either a solid or No. 1 Morse socketed mandrel can be supplied, to take a stub cutter arbor or taper arbor with spacer collars. Overall dimensions of the machine are 11 in. by $7\frac{1}{2}$ in. by 18 in. high, and the weight is 88 lb. approx.



The Jag slot-milling machine

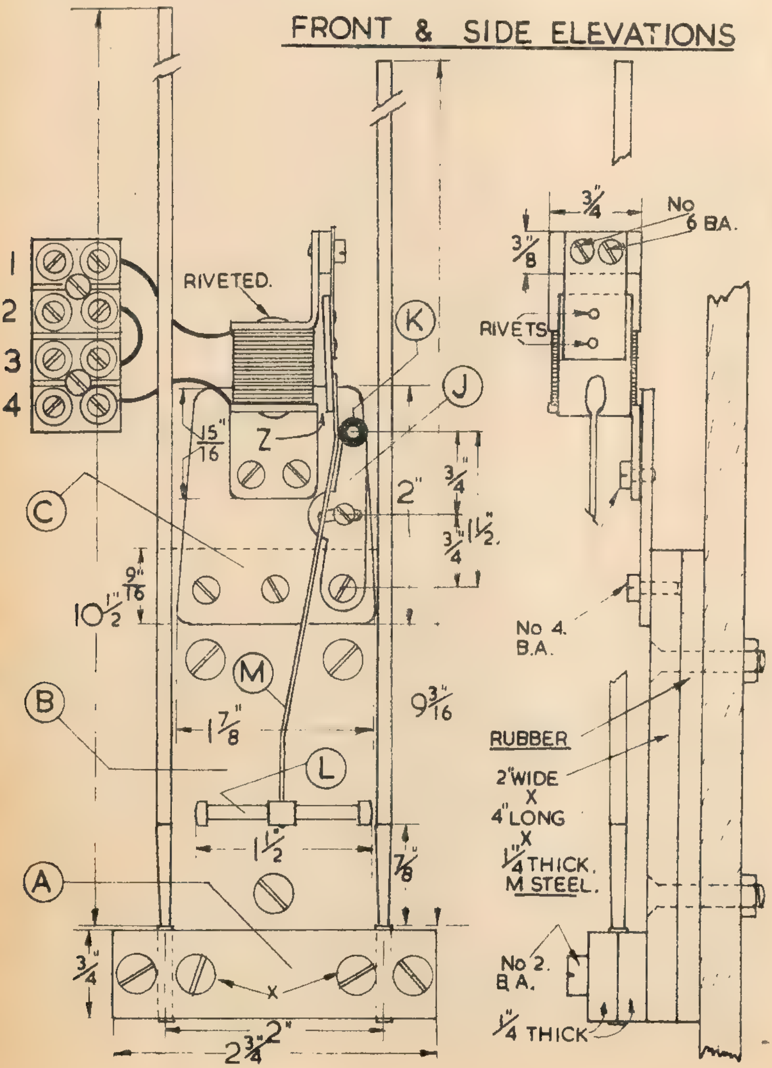
A Simple "Ding-Dong" Door Bell or Chime

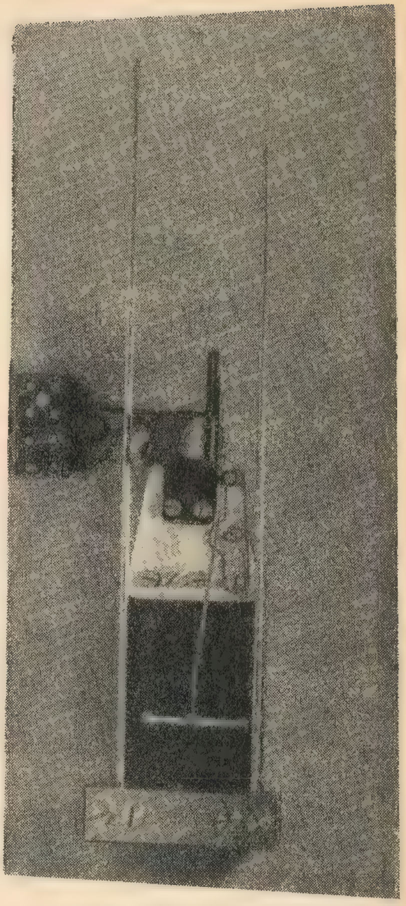
By C. R. Jones

WHEN our door bell decided to pack up, after being in use for more than 25 years, it was examined to see if it was worth repairing, but it was decided that it would be a waste of time and trouble, and it was necessary to adopt some alternative.

As I had a set of chiming-rods, which were made experimentally for the clock chiming gear (described in August and September, 1951) and were not used for that purpose (as $\frac{3}{16}$ in. diameter rods *were* used), the experimental ones being $\frac{1}{8}$ in. diameter, it was thought that two of these could be used for making a "ding-dong" door bell.

After some consideration and experiment, the arrangement shown in the photographs, drawings and sketches was evolved. It will be seen that two rods are mounted vertically in a gripping device, which is attached to a steel or iron plate, and which in turn is mounted on a board. Attached to this steel plate is a brass plate, to which is screwed the operating magnet, and to the top of this is fixed the armature, which carries the hammer for striking the rods.





The complete bell or chime

The two ends of the winding on the magnet are taken to the terminal block, shown on the left, to which the battery, and bell-push are connected. The operation is very simple, as no contacts, except the ones in the bell-push, are required. When the push is depressed, the armature is attracted to the magnet, and the hammer strikes the left-hand rod; on the push being released, the armature and hammer return to the right, the hammer striking the short rod.

Before this arrangement was tried out, it was thought that people pressing the operating push would hold the push down in the first instance so long that the period between the "ding" and "dong" would be unnecessarily lengthened, but after a trial of about eight months, this has been found not to be the case.

The one to be described operates on

two doors, the "ding-dong" being, of course, the same in both instances. To overcome the disadvantage of this, in the circuit to the front door, a simple indicator, of the pendulum variety, has been included, which makes it easy to ascertain which door the bell is being operated from. This indicator is shown by a photograph, and sketches, and is also described.

In the article on a door chime by "Artificer" in THE MODEL ENGINEER in April, 1953, brass wire 0.110 in. in diameter was used, and the lengths for various notes were given in that article. The ones used in the arrangement to be described were of $\frac{1}{8}$ in. diameter brass; the longer rod being approximately $10\frac{1}{4}$ in. from the top to the reduced portion where it is gripped, the shorter rod being $9\frac{3}{16}$ in. approximately. I understand that the two rods are about G. and C. in the key of G Major; anyway, I think they make quite a pleasant combination, and others can be tried if desired.

steel 2 in. wide, 4 in. long, and $\frac{1}{4}$ in thick. This, as is described above, has two holes drilled, and tapped for No. 2 B.A. at its lower end. Three other holes $\frac{3}{16}$ in. in diameter are drilled and counter-sunk to receive the attaching screws for fixing to the backboard.

To the top end of this plate is secured another plate *C* but made of brass about 3/32 in. in thickness, $1\frac{7}{8}$ in. in width, and 2 in. in height; this was slightly tapered off towards the top, and the corners rounded off as shown. This is secured by three No. 4 B.A. cheese-headed set-screws, drilled and tapped into the steel plate *B*.

The magnet is seen in sketches *D*, *E* and *F*. Portions *D* and *E* were made from mild-steel plate $\frac{1}{16}$ in. thick, and $\frac{3}{4}$ in. in width, and to the sizes shown; one corner on each being rounded where shown, and both being drilled with a $\frac{3}{16}$ in. diameter hole as indicated, the said holes being slightly countersunk for riveting purposes.

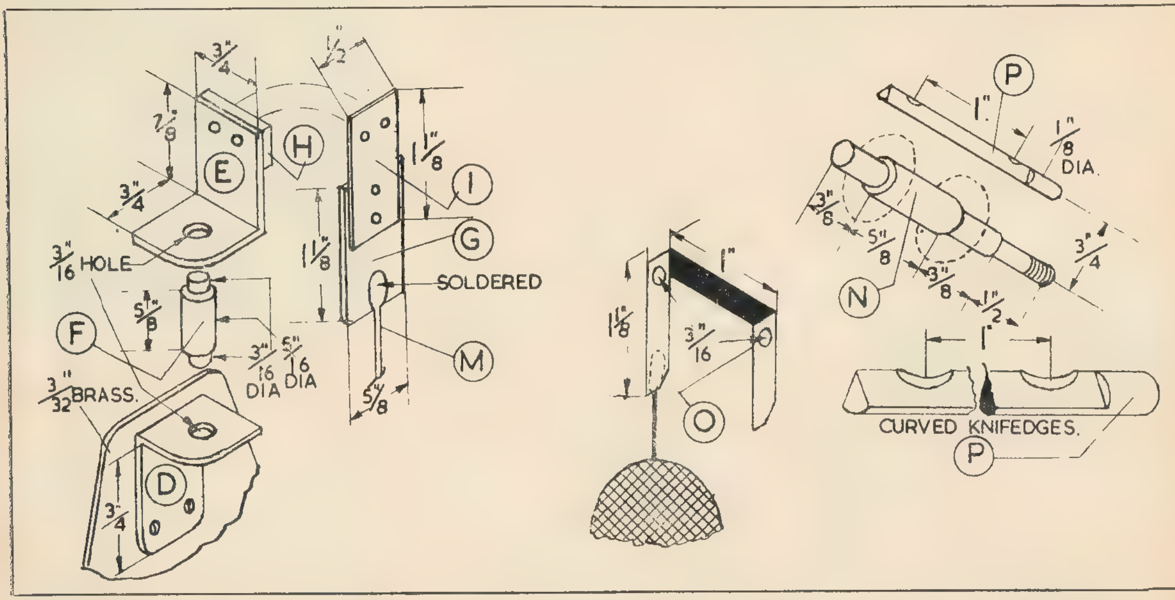
The magnet core *F* was turned from

rivets) is a piece of feeler blade 0.008 in. thick by $\frac{1}{2}$ in. in width and $1\frac{1}{8}$ in. long.

The top end was screwed to the bracket *E* by means of two No. 6 B.A. cheese-headed set-screws, the holes in part *H* and the bracket *E* being tapped to receive them.

The wire *M* was a piece of $\frac{1}{16}$ in. diameter steel wire, the top end being flattened, and soldered to the lower end of the armature as shown. The lower end of this wire was soldered into a $\frac{1}{16}$ in. diameter hole in the centre of the hammer *L*. The hammer *L* was a piece of brass $\frac{3}{8}$ in. in diameter, and $1\frac{1}{2}$ in. in length, turned down to about $\frac{1}{8}$ in. in diameter where shown, to lighten it.

The wire *M* was bent to the shape shown, so that when the armature was attracted to the pole-pieces of the magnet, the left side of the hammer struck the left-hand rod, but when operated by hand the hammer was about $\frac{1}{16}$ in. away from the rod, the spring of the wire allowing it to strike when electrically operated.



Referring to the drawings, front and side elevation, and the sketches: *A*, the part which grips the lower ends of the rods, is composed of two pieces of bright mild-steel $\frac{1}{4}$ in. thick, $\frac{3}{4}$ in. wide, and $2\frac{3}{4}$ in. in length. The holes for gripping the rods were drilled where shown, $\frac{1}{8}$ in. in diameter, and at 2 in. centres, half of each hole being in each piece. These pieces were held together by means of No. 2 B.A. cheese-headed set-screws, one at each end, the top four holes being drilled clearance for these, the two outside holes in the under piece being drilled and tapped No. 2 B.A.

The two screws marked X go through clearance holes in *both* pieces of steel, and screw into the mild-steel plate at the back, into holes drilled, and tapped to receive them. *B* is a piece of mild-

$\frac{5}{16}$ in. diameter mild-steel, the centre portion being left $\frac{5}{8}$ in. in length, and both ends turned down to $\frac{3}{16}$ in. in diameter, and long enough to rivet over, after going through the holes just mentioned. These parts were softened by being heated to red heat, and slowly cooled.

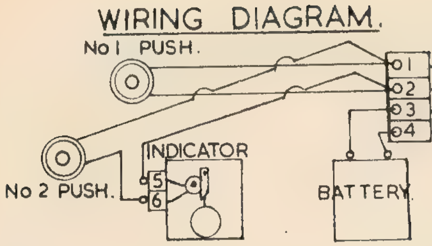
The core *F* was then riveted into place, making sure that the parts *D* and *E* were in the correct position. The armature *G* was made from $\frac{1}{16}$ in. thick mild-steel to the sizes shown, and softened as the other parts.

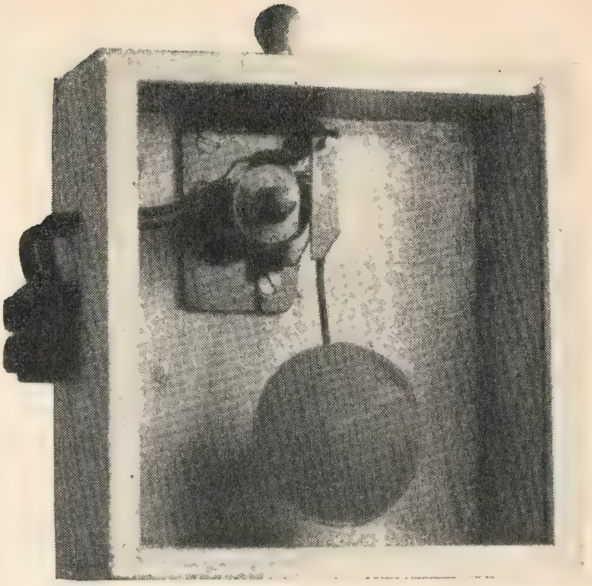
The piece *H* was of brass 3/32 in. in thickness, $\frac{5}{8}$ in. in width, by $\frac{3}{4}$ in. in length, and packs the armature away from the magnets; it was fixed by being sweated into position with soft solder.

The flat spring *I* (which is attached to the armature by means of two small

To control the hammer on the rebound, an adjustable stop was fitted, as shown by *J* and *K*. *J* was a piece of $\frac{1}{16}$-in. brass to the shape shown, with one hole at the lower end to be accommodated on the right-hand screw holding plate *C*, to plate *B*, and about its middle having a curved slot, so that a No. 6 B.A. cheese-headed set-screw can lock *J* in the correct position when adjusted.

At the top end of *J* was fitted an $\frac{1}{8}$ in. diameter pin about $\frac{3}{4}$ in. in length, having a short length of rubber tubing slipped on it as a stop, which limits the travel of the wire *M* to the right. This stop is adjusted to prevent the hammer touching the right-hand chiming rod, by about $\frac{1}{16}$ in. when the armature is at rest. It may be necessary to bend the flat spring *I* slightly towards the





The indicator

right, to make sure the hammer strikes the shorter chime rod on its return.

The clearance between the lower end of the armature and the part *D* is about $\frac{1}{16}$ in. in the present case (see *Z* on the elevation). The chiming-rods are tapered off at the lower ends for a distance of about $\frac{7}{8}$ in. to nearly half their diameter. The hammer was made to strike just above this tapered portion.

The magnet *D*, *E*, *F* was wound with ten layers of No. 27 silk covered wire, the two ends of the winding being connected to Nos. 1 and 4 on the terminal block shown. In the present case, the bell or chime was mounted on a piece of mahogany $\frac{3}{8}$ in. in thickness, and 12½ in. by 6 in., by means of three countersunk set-screws and nuts, a piece of rubber about $\frac{3}{16}$ in. in thickness being placed between the wood and plate *B*.

When all is fitted, and connected up as No. 1 circuit (see wiring diagram), it should be possible to adjust the hammer and stop (*J* and *K*), to give two clear notes by pressing the push and releasing. A 3-volt cycle lamp battery should be all that is necessary. Of course, when fitted in its ultimate position, it depends on the length of run of wires as to how much voltage drop is experienced, but if necessary an extra volt or two can be used.

As before mentioned, if the bell is to be operated from more than one position, it will be necessary to make up some form of indicator to sort things out. In the present case, a very simple one was made to distinguish the front door from the back, and this is shown in the photograph, and sketches.

The magnet core is shown by *N* (see sketch). This was made from $\frac{5}{16}$ in. diameter mild-steel, turned down for a distance of $\frac{3}{8}$ in. at each end to $\frac{1}{4}$ in. diameter; one end having an extension $\frac{1}{2}$ in. in length and $\frac{3}{16}$ in. in diameter, and being threaded for a short distance as shown. Two thin brass washers, $\frac{3}{4}$ in. in outside diameter, and having $\frac{1}{4}$ in. diameter holes, were sweated on to this core, where shown, by the dotted circles, to form the bobbin.

Although the following is slightly different to the one made, it is suggested that a small brass plate, say 1½ in. square, is made, having a $\frac{3}{16}$-in. hole for the rear end of the core to go through, with another hole $\frac{1}{8}$ in. in diameter, and at $\frac{3}{4}$ in. centres from it; this hole is for the round portion of the part *P* which should be a tight fit.

The pendulum portion is shown by *O* in the sketches, and was made from a piece of tinplate (tinned iron) about $\frac{5}{16}$ in. in width and to the sizes shown; the two $\frac{3}{16}$-in. holes thread on to *P* and work in the two curved knife edges. An inch or two of wire was soldered to the front limb of *O* and had a disc of very light tinplate soldered on as shown. Portion *P* was made from $\frac{1}{8}$ in. diameter silver-steel, tapered off (except the portion which goes tightly into the brass plate).

The two curved knife edges were put in at the correct places, by means of a small round needle file. The bobbin portion was given the same winding as the previous magnet, and the two ends brought out to and connected to a twin terminal-block on the side of the small box which houses the instrument. It should be mentioned here, perhaps, that in the cases of both magnets, the bobbins were insulated with brown paper before winding.

The box in the present case was made of wood $\frac{1}{4}$ in. in thickness, having a groove for a piece of glass to slide in at the front to keep out the dust, etc. It is suggested that a $\frac{3}{16}$ in. diameter hole is drilled in the back of the case, so that the $\frac{3}{16}$ in. portion of *N*, after passing through the brass plate suggested before, can be put through and secured by a nut and washer.

This method will, by turning the brass plate carrying *P* slightly, enable the clearance between the ends of the armature *O*, and the magnet core to be adjusted if necessary. In the present case this clearance, with the pendulum portion at rest is about $\frac{1}{8}$ in.

If the indicator is made and used, it should be wired up as shown by No. 2 push in the wiring diagram. No movement of indicator shows push No. 1 is being operated, and indicator swings showing that push No. 2 is in use.

One or two differences in design may be noticed between the photographs, and the drawings, but the alterations, where they occur, have been considered either necessary additions or omissions. Quite a number of points have been left to the constructor to please himself over, such as size of rivets, exact positions of holes, etc., and, of course, other sizes of steel, brass, etc., can be used at the reader's discretion, but I should advise sticking to the magnet sizes, etc.

Looking at the drawing, it may appear to the reader as rather complicated, but there is not much in it, really, and is quite simple. The dimensions of clearances given are only approximate, and may have to be altered by experiment, as for instance the hammer adjustments, which will depend quite a lot on the spring of the wire used for *M*. The terminal blocks used were those sold in a strip by most wireless shops, and the amount wanted can be cut off to make the size blocks required.

To make the holes in the feeler blade or similar spring, I always punch the holes through with short lengths of silver-steel of the appropriate sizes, using just a simple jig made from a piece of mild-steel of say $\frac{1}{16}$ in. in thickness, bent over double (and then drilled through both thicknesses with suitable sized drills) there being sufficient space between both to just slip the spring between. If the spring is marked with pencil crosses where the holes have to go, it can be moved and the cross clearly seen through the top hole, when in the correct position. Assuming the gadget is standing on a solid surface, (say a flat iron) a sharp blow with a light hammer, using one of the silver-steel punches, should make a clean hole.

L.B.S.C.'s Lobby Chat

LATHE BEARINGS

ONE reason for the appearance of these notes, is an endeavour to offer sound advice and instruction, based on actual personal experience. As my damaged wrist is not yet in suitable condition to proceed with further drawings for the *Netta* quins—though, thank goodness, the pain has eased off a bit !—let's see if we can rid friend "Novice" of Cardiff, of the bewilderment expressed in his letter on page 86 of the issue of January 20th last. I should imagine that there are many others who have not seen a type "R" Milnes lathe, or even the specification for same; so an explanation may prevent any wrong impressions. Just to reassure friend "Novice" that I know what I am writing about, it is now over sixty years since I first used a lathe; and one can learn a lot in that space of time. My first screwcutting lathe, as older readers well know, was one of the first lot of treadle-driven Drummonds of the cantilever-bed type ever turned out from the then little shop at Ryde's Hill; my last Drummond was a type "M," now in the possession of Driver Syd Herbert and his son John, at their home at Faversham.

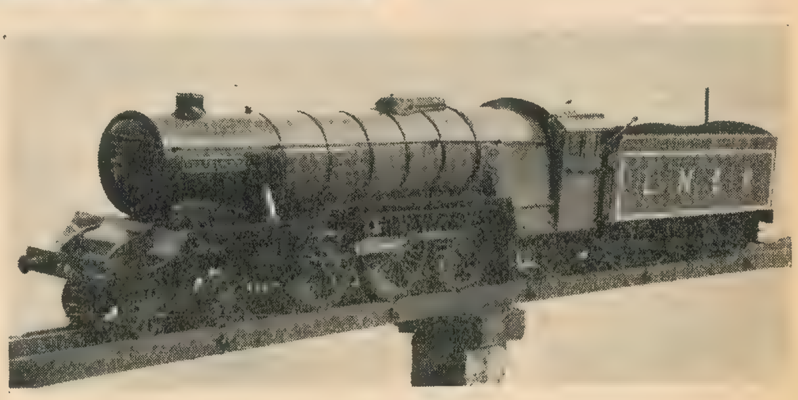
The type "R" Milnes, which I purchased in 1923, has a spindle $1\frac{1}{4}$ in. diameter, as correctly stated by "Novice." It was the sixth one of the new design (I got my order in good and early after the first advertisement appeared) and the spindle ran in two Ransome and Marles roller-bearings. I found it impossible to get a perfect finish on the work, with these bearings; and Mr. Milnes, who would do anything to see that every customer was complete satisfied, visited my old home at Norbury, with his son, and tested the machine for himself. He said it was the rollers, and offered to supply me with a hardened steel cone front bearing, in place of the roller-bearing. In less than a week, they came down again from Bradford and fitted it. It's still in the machine, and has not needed adjustment for many years. The finish of the work still not being good enough, a bronze bush was substituted for the other roller, which did duty for many years, and was eventually replaced by another hardened steel coned bearing, similar to the first, but smaller.

Now, Bro. "Novice," take note. The cone bearing is $2\frac{3}{8}$ in. long. The male part of the cone is $2\frac{1}{4}$ in. diameter at the large end, and tapers about $\frac{3}{16}$ in. toward the smaller end. I can't give you the exact size, because the inner end of the bearing is blanketed by the boss of the backgear wheel on the mandrel, and it's too much like hard work to dismantle it, even if my wrist were O.K. It is fitted on the $1\frac{1}{4}$ in. end of the spindle, and secured by a sunk key, a sound engineering job. The female part of the cone bearing is a tight fit in the huge recess bored in the headstock casting, to accommodate the original roller-bearing. I hope that this explanation clears away all bewilderment. Incidentally, this bearing carries a $7\frac{1}{2}$-in. Burnerd three-jaw, weighing 32 lb. with ease. I had to fit the backplate "inside out" as the kiddies would say, to allow the jaws to open in the gap. The mandrel nose is $1\frac{3}{8}$ in. long, the plain part, or register, being $1\frac{3}{8}$ in. diameter, and the screwed part $1\frac{1}{4}$ in. diameter, eight threads per inch.

Harry Park's "Princess Royal" with test tender

Cutting Speeds

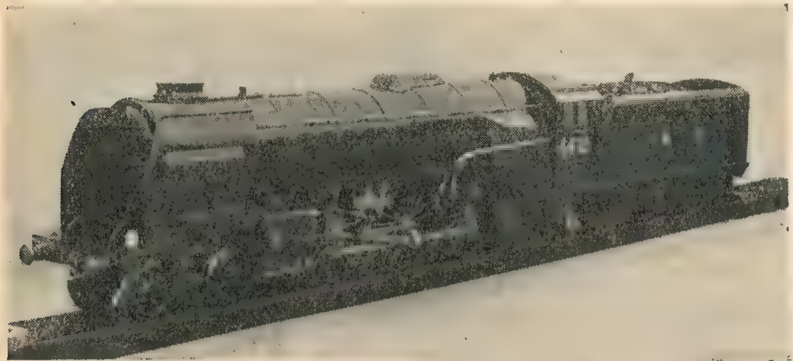
Bro. "Novice" writes that 20 r.p.m. on a 5-in. wheel with a tungsten-carbide tool doesn't sound very impressive. Nobody said that it did ! The point is just this; that I'm trying to give information, based on my own personal experience, which, when followed, will give the same results as I obtain. As most regular readers know I was in charge of a small machine shop making aero-engine components, during the latter part of the Kaiser's war, some bright spark having discovered the fact that I would be more usefully employed there, than on the footplate. Owing to shortage of skilled labour, I did most of the toolmaking myself; and believe me, Bro. "Novice," I learned a dickens of a lot about high-speed steels, what they were *supposed* to do, and what they actually *could* do. Mind you, I



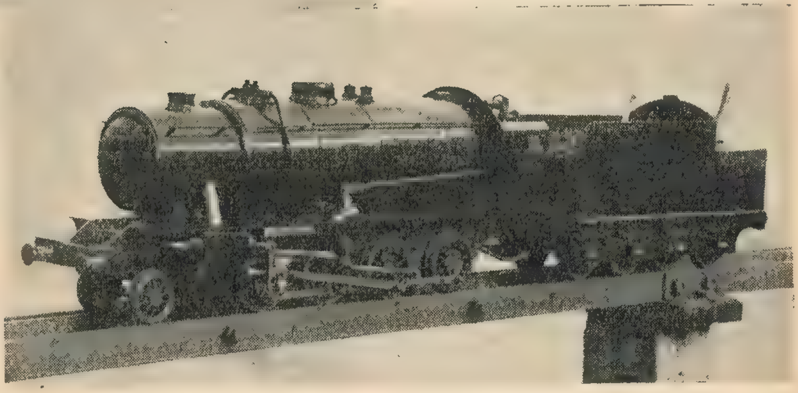
Harry Park's "Hielan' Lassie"

freely admit that there have been great improvements made in the composition of steels for turning tools; we had no tungsten-carbide tips of present-day quality, but the same sort of claims still obtain. For example, it was stated by somebody in this journal, that you don't have to bother about getting under the hard skin of a wheel casting any more, if using a tungsten-carbide tool, as the latter didn't worry about the hard spots. Fancy that, now! Well, soon after that appeared, I received a letter from another novice who had tried to turn *Princess Marina* wheel castings at normal speed, with a light cut, using a tungsten-carbide tool of the same well-known brand that I use myself. The treads came out badly chatter-marked, and when he examined the tool, he found the edge all chipped and crumbled. Having no suitable grinding-wheel, he had to send the tool away to have it ground.

Had this correspondent run his lathe at the speed recommended, and taken a fairly good bite, to remove the skin, he would have *saved* time, and saved the tool as well; it was a case of the hare and tortoise. Maybe the lathe bearings and slides were not such a good fit as they might have been; maybe a few high-speed drill shanks, some bits of hard rainwater guttering, and two or three of the park railings had somehow got mixed up in the metal from which the wheel castings were made. Be that as it may, the fact remains; and any raw recruit who is unprejudiced (very important that) will find that it is so, if he makes a test. In the case of our Cardiff brother, he ran at a suitable speed—half the battle won, to begin with—and a carbon-steel tool, properly hardened and ground, would most certainly do the trick on the soft grey iron of the quality used for piston-rings. Anyway, to cut a long story short, many followers of these notes have successfully turned hard-skinned cast-iron locomotive wheels, on lathes that were not in the best of condition, by following the instructions I have given, even using cast-steel tools hardened and ground in their own workshops. The finish has been perfectly satisfactory. My honest advice is, even if you are lucky enough to possess tungsten-carbide tools, don't force them to the limit; they will have a far longer life, and seldom need grinding, if used at reasonable speeds, and not used to scrape at the hard skin of a casting, running at goodness-knows-how-many r.p.m. But there is one thing you can safely do with a tungsten-carbide tool, and that is, get a lovely finish on your locomotive-wheels, by taking a very fine finishing cut over front, back and boss, at speeds ranging from 100 to 200 r.p.m. according to size of wheel. The turnings should come off as a fine dust; but *don't* touch the treads or flanges.



John Fowler's 3-cyl. 4-6-2 with Baker valve gear



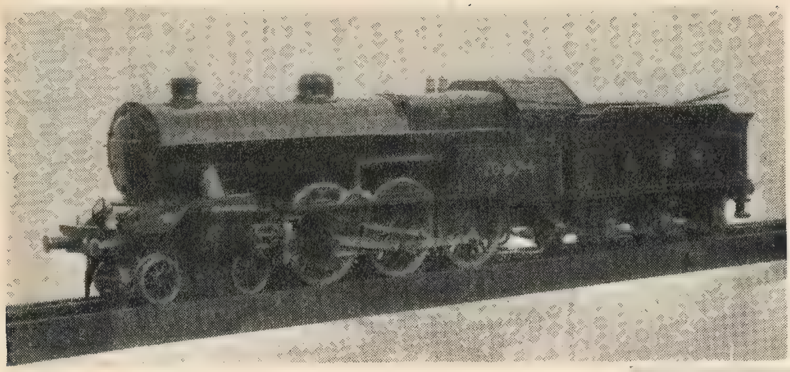
"Longshaw Liz," built by F. Houldsworth and H. Stanworth

High Boiler Pressures

Readers sometimes ask why I always specify a boiler pressure of 80 lb. or thereabouts, for the locomotives described in these notes, irrespective of their size, or the dimensions of the boilers. One recent querist had been evidently looking through back numbers, as he quoted Mr. C. M. Keiller's practice of running $2\frac{1}{2}$-in. gauge engines at working pressures of 150 lb. or more; and other builders have stated that they run water-tube boilers at around 120 lb. Here again, it is a question of experience. With the cylinder diameters that I specify, and the arrangement of valve-gear and setting, a working pressure of around 80 lb. has been found ample for all the work that the locomotive has been required to do; and that pressure doesn't put any abnormal strain on the boiler. I have tried higher pressures; for example, when I built my 4-12-2 *Caterpillar*, which is a four-cylinder eight-beat engine on $2\frac{1}{2}$-in. gauge, certain folk were boasting about what their engines could pull. Incidentally, at least two of them had previously ridiculed my assertion that a coal-fired $2\frac{1}{2}$-in. gauge job could haul a living load; strange, isn't it, how ideas veer around like a breeze in the Bay of Biscay, when somebody actually does the "impossible." Well, you all know by this time, that I always keep something up my sleeve, in case anyone starts "getting fresh" as our trans-atlantic cousins would say; so I built the "Cat's" boiler for a working pressure of 175 lb. if needed. The spacing of the firebox stays looks like that of a full-sized engine.

The high pressure was never needed. At the 1926 Model Railway Club Exhibition at the Kingsway Hall (I was a member then) she took her turn on the passenger-carrying track, taking loads of ten at a time, with 100 lb. only; and at a friend's track in "Baernegum," she pulled a load of four adults and twelve assorted Boy Scouts, on two cars with a builders' scaffolding plank in between, with just over 110 lb. She now blows off at just under 70 lb. as the safety-valve springs are weak, but trots around with three cars and three adults on a crack of throttle, which is all I need on my road now.

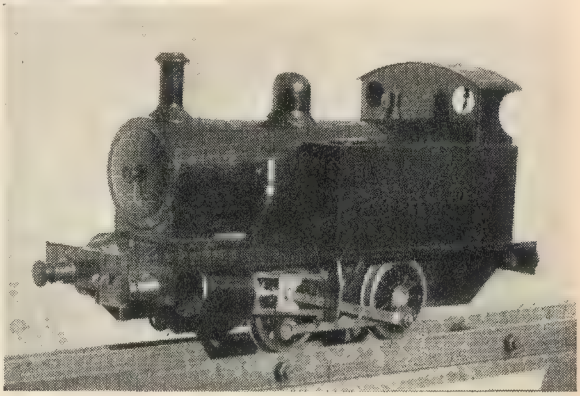
Mr. Keiller is a keen experimentalist in addition to being a craftsman of exquisite skill, and he had a reason for trying high pressures, which his locomotive boilers will maintain; not so in the case of some others which I recollect. In the early days of this journal, there appeared a short description of a hybrid 4-8-0 made entirely of brass, frames and all; I believe the builder's name was Rock. The boiler was a simple "pot," consisting of a piece of tube with two soldered-in ends, with a stay through the middle, and Bro. Rock astonished the



natives by asserting that it worked at a pressure of 140 lb. per sq. in. This statement, coming at a time when 30 lb. was considered high, caused readers to "hae their doots," and several of them wrote in, asking if friend Rock would describe how the boiler was fired, to raise such a pressure. He responded with a sketch of the burner. It was a pear-shaped trough running the full length of the boiler, the narrow part being uppermost, and formed as a long slit; gauze was used as "wick." When the trough was filled with methylated spirit, lighted, got hot, and vaporised the spirit, the whole boiler must have been enveloped in flames, and I don't doubt for one minute that the steam gauge climbed to 140; but whether the needle stayed on that figure as soon as the regulator was opened, is a horse of another colour, as the flames would be blown away from the boiler as soon as the engine started to run. She was called *La Lilliputienne*; *Fiery Flo* would have been more appropriate !

In my L.B. & S.C.R. days, when living at Dulwich, I was quite unaware that in the same road, there lived another locomotive builder, named Stark. He had no lathe, only a bench in a back room, littered with hand tools, with a space about a foot square in which to work. All his jobs were built up from purchased commercial components, and a weird and wonderful collection they were. He only fitted one cylinder in his inside-cylinder engines, and I don't think he ever fitted any gear other than purchased loose eccentrics. The boilers were water-tube type, and he fired them with Primus burners; whenever he steamed one, he always let the pressure rise to 160 lb. or thereabouts, before starting away. Years after I left Dulwich, a mutual friend introduced him to me, as he wanted to get an injector that would work at 160 lb. and it was then that I learned from his own lips, about his own work, and that we had lived for years in the same road without knowing of each other's existence. Incidentally, truth is ever stranger than fiction; at a distance of over 12,000 miles, I brought together two locomotive-builders who lived in the same road in a town in New Zealand. Neither

E. Holden's "Hughes" type L. & Y. 4-6-0



Right: Bert Hayhurst's "Juliet"

knew that he had a fellow-conspirator just a few doors away. Poor Stark departed long ago to the land beyond Jordan, and his "freak" locomotives are scattered far and wide; to the best of my knowledge and belief, they have been rebuilt. I know of one such, which has been converted, and has run on my "long straight"; it is too rigid to take the curves on the continuous line. It doesn't look at all bad, and goes very well.

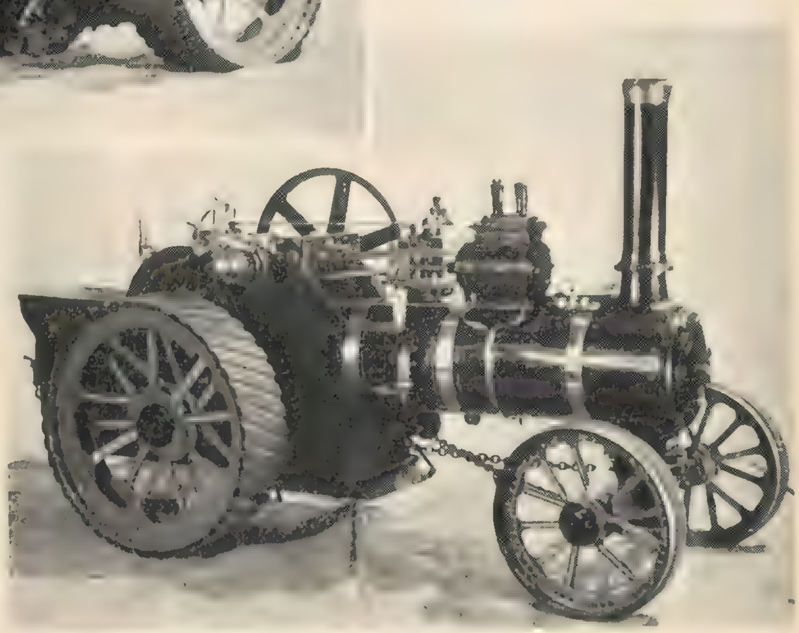
The Blackburn Live Steamers

The members of this club are another quiet but cheery gang who don't seek publicity. I don't know much about the history of the club itself, but I *do* like their title ! Anyway, they can do the job in no uncertain fashion, as the reproduced photographs will show; I am indebted to the secretary, John Fowler, for the originals, most of which were taken by Mr. John Yates.

The $3\frac{1}{2}$-in. gauge *Princess Royal* was built by Harry Park; the L.N.E.R. tender was coupled on for testing purposes, and belongs to his $3\frac{1}{2}$-in. gauge *Hielan' Lassie*, also shown. This one has a single chimney, instead of the double one of the original. John Fowler's own version has the double chimney, and Baker valve-gear. The $2\frac{1}{2}$-in. gauge 2-8-0 built to the *Austere Ada* instructions, and known as *Longshaw Liz*, is the handiwork of two members, F. Houldsworth and H. Stanworth; a job well *worth* doing ! The "Lanky-and-York" Hughes type 4-6-0 is also $2\frac{1}{2}$-in. gauge, and was built by E. Holden; another realistic-looking turnout. Last, but decidedly not least, we have another example of the ever-popular *Juliet*; I often wonder how many *Juliets* are now in existence—and they apparently don't worry about any Romeo, maybe they look on their builders as that person ! This one was built by Bert Hayhurst, and is the good old stand-in ; if ever the club is short of motive power, Bert nips off home, and comes back with her under his arm. Good work, boys of the B.L.S.

A 2-in. SCALE TRACTION ENGINE

By Dennis Carter



SOPHIA, my 2-in. scale steam traction-engine, that I have been building for the past four years, is very "free-lance," although bearing some strong features of a "Burrell" general-purpose engine as mostly used for agricultural work. She was built purely for the love of a traction-engine, and I make no claim for anything original or wonderful; but she is just as I think an engine should look and behave. Some of the fittings, the steam and water gauges, for instance, maybe seen to be larger than scale. This is for a purpose, as I believe in having the satisfaction of knowing that the larger fittings show a truer reading of pressure and water-level than smaller ones.

The boiler is all-brazed and tested to 175 lb. water pressure. The cylinder block was cast for me by Mr. Dick Simmonds, as were also the wheel hubs and rims. Rods and all motion work are in stainless-steel, which in my humble opinion, is the finest material yet invented for countless things to be made of. In the engine, it was hard to work, but well repays the toil involved (I seem to be always admiring my polished connecting-rod !)

The crankshaft was drilled and hack-sawn out of a block of mild-steel obtained locally, and was my first attempt at such a thing. It came out far better than I had expected, and no one was more surprised and pleased than I was. A great many parts for the engine were turned up out of all sorts of pieces from the model engineer's treasure-chest, the scrap-box, and I like making up fabricated "castings" far better than having them actually cast. The engine is a three-shaft job with four splines on the end of crankshaft for the two-speed gears. At the present time she is not quite finished, as the second-shaft gears are yet to be made.

The differential is made and mounted on the countershaft. The two main gears are to be fitted and are double drive on the last motion. Although she has not had any road trails yet, owing to the above gearing not being completed, she has worked running stationary for many hours. The boiler steams well and, when we are going to have a run, my wife generally takes over the stoking, a job she seems to love doing and she does it well, leaving me to attend to other duties. The engine works perfectly, and on only 15 lb. is extremely lively and has plenty of power. The fuel is Welsh coal or anthracite.

I hope this small effort will be of interest to others, and if there are any other traction-engine fans building similar engines and think I could help them with any detail at all, I will be most willing to do so *via* our editor.

It is a most hopeful sign in the midst of so much "destruction by scrapping" of these lovely old friends, the tractions, to see enthusiasts building their small engines.

The principle details of my engine are:

Boiler.—$\frac{1}{8}$ in. copper plate to a working pressure of 80 lb., 5-in. diameter. 11 copper flue-tubes, $\frac{5}{8}$ in. diameter.

Cylinder.—Single high-pressure, $1\frac{1}{2}$ in. bore × $2\frac{3}{4}$ in. stroke, cast gunmetal.

Flywheel.—Cast-iron, 9 in. diameter, 1 in. face.

Crankshaft.—Mild-steel, $\frac{5}{8}$ in. diameter × $11\frac{1}{2}$ in. long.

Motion Work.—In stainless-steel. Guide-bars, throttle-rod, regulator-rod, steering wheel and shaft, all levers, piston-rod, valve-rod, connecting-rod, etc.

Hind Wheels.—12 in. diameter, $3\frac{1}{4}$ in. tread, steel strakes.

Front Wheels.—8 in. diameter, $1\frac{1}{2}$ in. tread.

All boiler fittings in gun-metal and phosphor-bronze. All feed-clack boxes and pumps fitted with stainless-steel ball valves. Water capacity: Boiler, 5 pints; tank 3 pints. Weight approx. 140 lb.

The engine was exhibited at the Royal Norfolk Show last summer; it was coupled to a 2-in. scale Fisher & Humphries threshing drum, on the stand of Lenwoods Ltd., a local firm of agricultural engineers.

Sharpening Engraving Tools

By "Duplex"

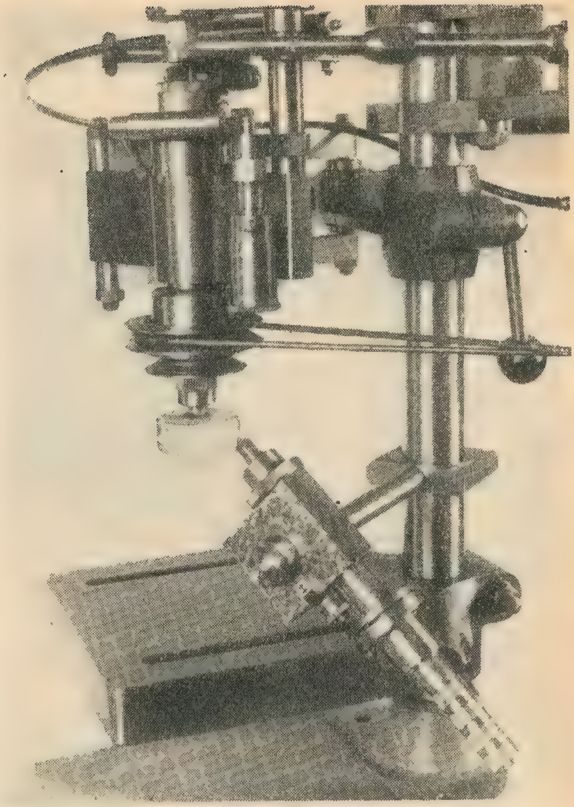


Fig. 1. The grinding attachment mounted on the engraving machine

WHEN using the engraving machine, recently described in this journal, it is essential, in order to ensure accurate and clean engraving, to keep the small cutting tools properly sharpened and with the point exactly central. This can readily be done with the aid of the attachment illustrated and, moreover, the design incorporates a fitting that enables any degree of back-off to be given to the cutting edge, while the extreme point is maintained truly central. We ourselves have found, and this has been confirmed by correspondents, that engraving tools cut quite satisfactorily without any back-off; nevertheless, the attachment will grind the point equally well with or without back-off. The small grinding wheel is mounted on the spindle of the engraving machine and is, therefore, driven at the high speed necessary for effective working. The particular wheel used was obtained from the Universal Grinding Wheel Co., ready mounted on a ¼ in. diameter spindle to fit into the chuck of the machine. The White Bauxilite wheel is 1¼ in. in diameter and ½ in. in width. This abrasive material with a grain size of 150 gives a high finish to the work, and has little tendency to cause overheating; in this connection, good results are obtained by applying a little thin oil to the surface of the wheel.

The attachment is clamped to the column of the engraving machine by means of the arm assembly *A*.

The banjo head is bored to fit the column closely, and is slit across after the two Allen cap-screws have been fitted.

At its outer end, the arm is shouldered down to take the cutter spindle bracket *B*, which is held frictionally by a nut and washer so that adjustments can be made to align the engraving tool correctly in relation to the grinding wheel. To afford an accurate means of adjusting the depth of grinding, the bracket is furnished with a micrometer setting-screw *C*. This screw is threaded 40 t.p.i. and its head is graduated with 25 index lines, to enable a feed to be given in thousandths of an inch.

Frictional control of the setting-screw is provided by means of a screw, a spring, and a brass pad *E*, which are carried in a hole drilled in the lower surface of the bracket.

To facilitate adjusting the feed, a small index plate *D* is attached to the side of the bracket.

The cutter spindle *F* should be turned between centres, and afterwards lapped to a close working fit in the lapped bore in its bracket. The nose of the spindle is bored to take the collet already made for the engraving spindle, and the closing collar *G* is bored and threaded at one setting in the chuck. As it is essential for the recess in the spindle nose to be bored exactly concentric with the bearing surface, the tail of the spindle should be centred

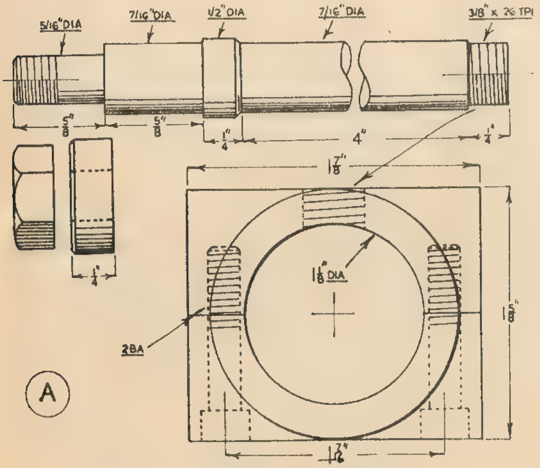


Fig. 2. The carrying arm and clamp head

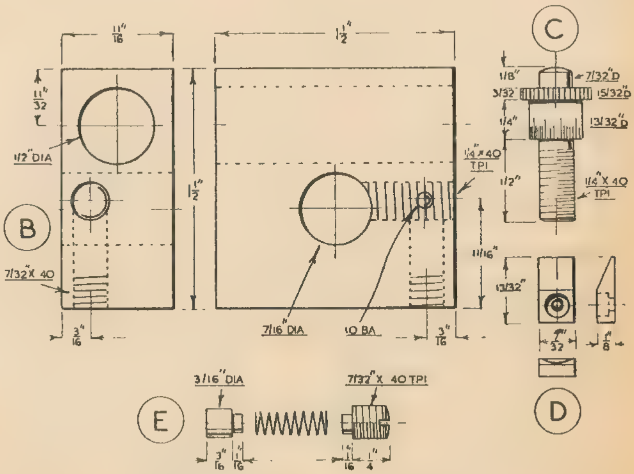


Fig. 3. B—the spindle bracket; C—the micrometer feed screw; D—the index plate; E—the pad-piece components

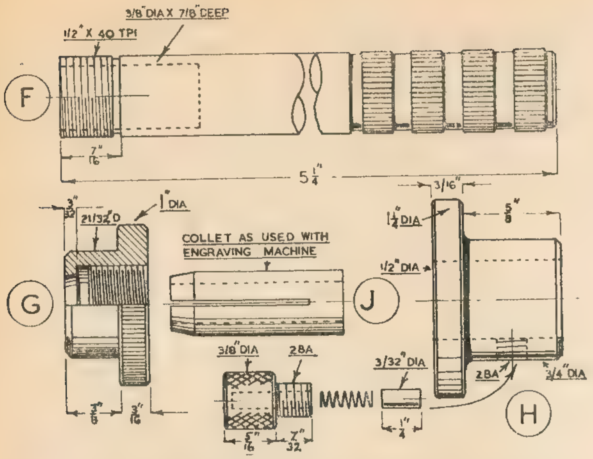


Fig. 4. F—the cutter spindle; G—the collet-closing nut; H—the feed collar; J—the collet

in the four-jaw chuck, and its outer end supported in the fixed steady, so that a drilled hole can be finished to size with a small boring tool.

The Feed Mechanism

The feed collar *H* is machined to a close sliding fit on the main spindle, to which it can be locked by means of a knurled finger-screw fitted with a pad-piece.

To afford a rise and fall motion as the spindle is rotated, in order to give the tool a back-off, a tilting swash-plate is fitted to the feed collar with three 8-B.A. screws. As can be seen in Fig. 6, a fourth, 4-B.A. screw is carried in the feed collar, so that, when this screw is tightened, the swash-plate becomes tilted and serves as a cam to impart endwise motion to the spindle as it is turned with the fingers.

Operating the Attachment

The pantograph mechanism must be locked to maintain the engraving head fixed in position during the grinding process. This is readily done by drilling a small hole in the stencil table to take the point of the stylus. The bracket carrying the tool spindle is now rotated on its arm to the angle required for grinding the point of the cutter. Next, the swash-plate is adjusted to provide, as far as can be judged, the small amount of back-off needed. The feed collar is then rotated to bring the maximum eccentricity of the swash-plate pointing directly downwards, with the cutting edge of the tool set at the lowest point. The point of the tool is now advanced almost into contact with the grinding wheel, and the feed collar is secured to the spindle. After the motor driving the engraving head has been started, the tool is advanced just to touch the grinding wheel by turning the micrometer feedscrew. If the spindle is now rotated with the fingers through an angle of 90 deg., while keeping the swash-plate pressed against the feedscrew, a conical back-off will be given to the tool and the point will remain central.

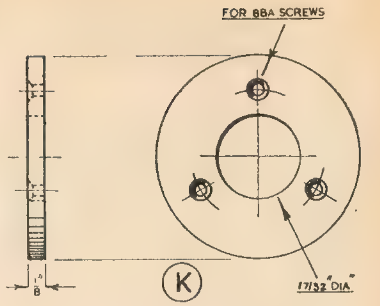


Fig. 5. The swash-plate

Before sharpening a blunted tool, the point should be ground to a true cone by setting the swash-plate level and rotating the spindle through 180 deg.; the back-off can then be ground.

If the spindle were rotated through 180 deg., with the swash-plate tilted, the point of the cutter would be ground eccentric to its long axis, and the tool, when in operation, would cut a series of small circles.

However, by rotating the spindle through an angle of only 90 deg., a small flat will be formed at the extreme tip of the tool, and this will result in the letters cut having a flattened apex where their two oblique sides meet. The width of this flat on both the tool and the work will depend on the amount of back-off given to the tool point. A tool ground without back-off, by setting the swash-plate level, will be found to cut quite well, especially in plastics and in the softer metals, and the sides of the engraved letters will then terminate in a sharp apex.

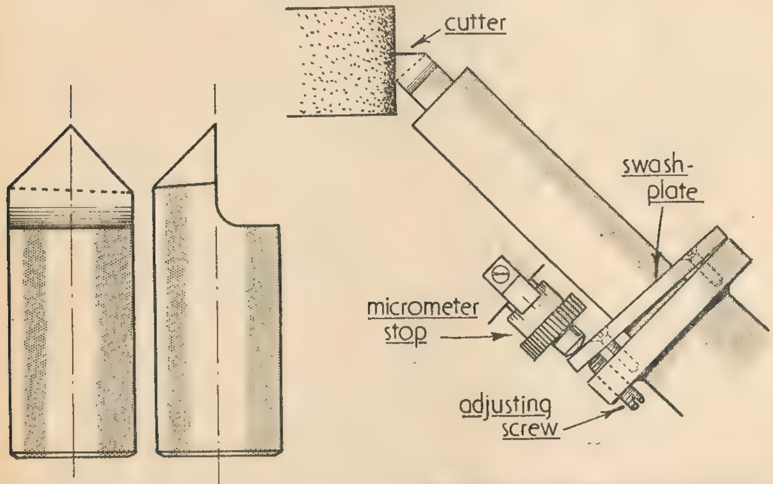


Fig. 6. Showing the action of the swash-plate and micrometer feed screw when backing off a conical cutter

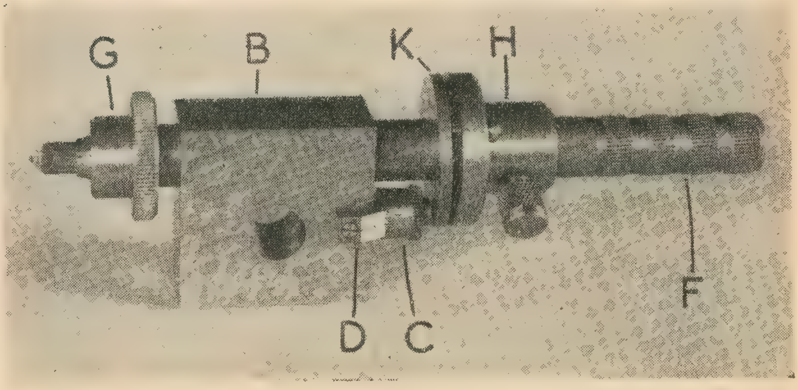


Fig. 7. The assembled cutter grinder

QUERIES AND REPLIES

THE " M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

(1) Queries must be of a practical nature on subjects within the scope of this journal.

(2) Only queries which admit of a reasonably brief reply can be dealt with.

(3) Queries should not be sent under the same cover as any other communication.

(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.

(5) A stamped addressed envelope must accompany each query.

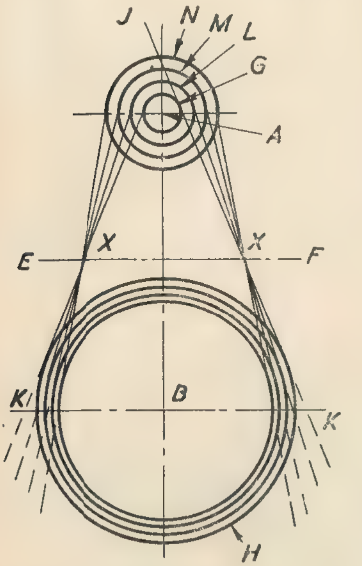
(6) Envelopes must be marked " Query " and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Foot Motor for Lathe

I have just bought a 3$\frac{3}{8}$-in. Zyto lathe and wish to make a treadle wheel to drive the lathe. Would you please let me know what diameter to make the three pulleys on the wheel, also what treadle stroke would you advise? The diameters of the headstock pulleys are 4 in., 3$\frac{1}{8}$ in. and 2$\frac{1}{4}$ in.

A. McQ. (Edinburgh 9).

The relative sizes of the three steps on the flywheel will depend on several factors, including the range of speeds required and also the centre distances of the flywheel and lathe spindles. In the circumstances, it is not possible to give a simple and direct reply to this query, but assuming that on the lowest speed, the lathe is required to run at five times the speed of the treadle, the small step on the flywheel will need to be 20 in diameter. The diameters for the other two steps can be ascertained



by setting out the pulleys geometrically, as shown in the drawing.

Draw to scale the intended distance between the centre of the mandrel A and the centre of the driving shaft B. Bisect this line AB and draw EF as the perpendicular to the point of bisection. With A as the centre, draw the concentric circles, G,L,M and N to represent at full scales the four steps of the cone on the mandrel. Then as G represents the cone of the smallest diameter, the diameter of the largest step of the driving pulley, calculated from the example given above, can be drawn as a circle H of that diameter on B as centre. Construct the tangent JK common to both circles G and H, and call " X " the point at which it intercepts E, F. Draw tangents to the circles L, M and N through X, and produce them beyond this point. The correct circles, to represent the remaining steps on the driving pulley can then be drawn, concentric with H, and touching these lines.

Regarding the stroke of the treadle, this again will depend to some extent on the design of the treadle and the distance from the treadle pivot, at which the connecting-rod or " pitman " by which it is connected to the treadle crank is located. With a treadle crank-pin of 2 in. radius, or " throw," it will be fairly satisfactory to connect the rod at about two-thirds of the distance from the pivot to the actual treadle step.

Air Compressors

With reference to the article on Government surplus piston-type compressors in the issue dated June 22nd, 1950 *of* THE MODEL ENGINEER, *I wish to construct a compressor unit using a single-phase $\frac{3}{4}$ h.p. capacitor motor.*

I should like some guidance on the diameter and weight of flywheel required for the compressor, to minimise snatch on the drive, and also to know whether the direction of rotation of the compressor is of any importance. No direction of rotation is indicated on the compressor.

I propose to direct-couple the compressor to the motor by means of reinforced hose and worm drive hose clips, or by means of a more robust flexible coupling. The motor speed will be 1,440 *r.p.m. with oil pressure fed to the main journal at about* 50 *p.s.i. The unit will be used for air pressures up to about* 200 *p.s.i.*

H.E.T. (Rossendale).

Your proposal to direct-couple the motor is not within the scope of the article, which recommended the use of a vee-belt drive with a speed reduction of at least 1 : 2, plus the use of a suitable flywheel. We consider that a $\frac{3}{4}$ h.p. motor direct-coupled would be of insufficient power for the higher pressures. In aircraft use, more power was available, the piston load being in the nature of 0.450 lb. at each revolution at 200 p.s.i. This precludes your proposed use of a reinforced hose coupling. If you wish to experiment with direct drive, we recommend the use of an outrigger bearing on the compressor with a flywheel interposed between this and the motor. A 10-in. diameter flywheel of 10 lb. weight with the mass mainly disposed in the rim, is suggested as a basis for trial. The motor should be started without load, by providing a pressure release in the line to the air receiver which is closed after starting. A non-return valve fitted at the inlet end of the receiver will retain its pressure during this time. The flywheel can incorporate a cooling fan, which will be necessary for the higher pressures. We consider that the direction of rotation is unimportant.

We suggest you try the following firms for compressors:

C. H. Vincent, 47-49, Essex Road, Islington, London, N.1.

K. McGrath, 244, Marton Road, Middlesbrough.

Herbert K. Staub, 55, Farringdon Road, London, E.C.1, market the Picador range of universal couplings.

Electric Clock Details

I am making the electric clock described in Mr. R. Barnard Way's book and should be obliged if you could advise me on the following:

(*a*) *As it is not convenient to cast the pendulum bob in lead as described, I propose having a cast-iron bob made, and presume this will not affect the design.*

(*b*) *I would like to run the clock from the mains supply, but in my case it is d.c. What modifications would be necessary to the magnet?*

T.D.H. (Nottingham).

(*a*) The cast-iron pendulum bob will be quite satisfactory, but as this metal is of lower specific gravity than lead, it will come out considerably lighter if made to the same dimensions. The weight of the pendulum has no direct effect on the time-keeping accuracy of the clock, but a heavy pendulum is very desirable to ensure sufficient momentum to avoid variation of pendulum swing.

(*b*) The windings for the clock magnet are intended to work on a.c. mains, and if it is decided to run the clock on d.c. supply, these windings will have to be redesigned, owing to the fact that the impedance of a magnet when running on a.c. reduces the amount of current passing through the windings.

We have no details of a suitable winding formula for d.c., but suggest that this could be ascertained by using approximately twice as many turns to start with, and experimenting by adjusting the number of turns, so as to obtain satisfactory working results.

HANDY CHANGEWHEEL STUDS

By P. S. Hall

IN my workshop, as in most others belonging to amateur engineers, space is at a definite premium. So much so that the clearance between the change-wheel cover of my Myford M.L.7 and the adjacent brick wall is barely $3\frac{1}{2}$ in., which makes the use of an orthodox screwdriver and spanner on the changewheel studs difficult, if not impossible. In any case, I object to fiddling about with a $\frac{5}{16}$-in. spanner on almost inaccessible nuts behind an inevitably oily change-wheel quadrant. Obviously something was required which could be easily adjusted from the front of the quadrant alone, yet be easy to operate in a very limited space.

Accordingly, after some thought, an arrangement was devised as shown in the sectioned drawing. (Fig. 1.)

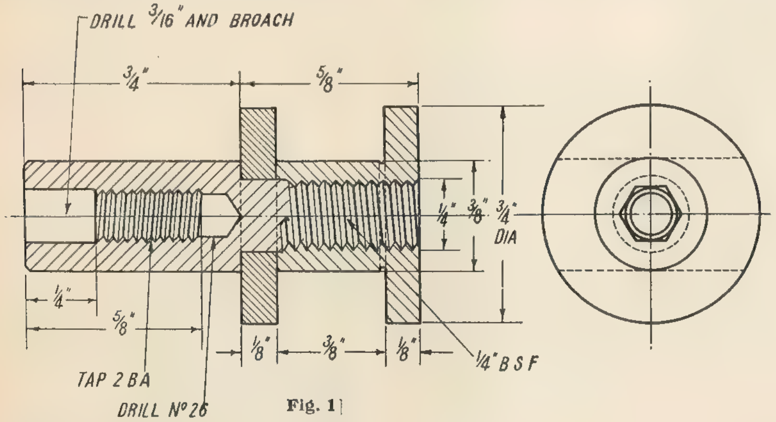


Fig. 1

Nuts (Two Off)

A piece of $\frac{3}{4}$ in. diameter mild-steel bar was gripped in a three-jaw chuck, skimmed, and faced on the end. It was then centred, a 13/64 in. diameter hole drilled $1\frac{3}{4}$ in. deep, and tapped $\frac{1}{4}$-in. B.S.F., holding the tap in the tailstock drill chuck.

While still in the chuck, two lines, each $\frac{3}{16}$ in. above and below the centre, were scribed on the front and rear of the bar. Lines were also scribed round the circumference of the bar where indicated in the drawing. (Fig. 2.)

Two flats were then filed down to the scribed lines, as shown, and the nuts parted off, using a $\frac{1}{8}$ in. parting tool, great caution being necessary due to the awkward shape of the waist.

Before parting off the second nut, the $\frac{1}{4}$-in. B.S.F. tap was run through to ensure that the thread would be deep enough.

Washers (Two Off)

The 13/64-in. hole was next opened out with a letter " D " drill and reamed out to $\frac{1}{4}$ in., finally parting off to $\frac{1}{8}$ in. thick in the usual way.

Studs (Two Off)

A piece of $\frac{1}{2}$ in. diameter mild-steel bar was held in the three-jaw chuck, faced on one end, centred to $\frac{5}{16}$ in. diameter on the face, and a number 26 hole drilled $\frac{3}{4}$ in. deep. A $\frac{3}{16}$-in. hole was then drilled $\frac{1}{4}$ in. deep and a broken hexagon key (Allen key), of the same size as that supplied with the lathe for use with the bearing cap screws, mounted in the tailstock drill chuck and used as a broach to make the hexagon socket. (A piece of silver-steel, filed to shape and hardened, would serve the same purpose.)

It is advisable to insert a packing-piece inside the chuck, between the bar and the mandrel nose, to take up the thrust of the broaching operation.

After broaching, a 2-B.A. thread was tapped in the remainder of the original number 26 hole.

The tailstock centre was then brought into use (hence the large diameter centre-drilling) and a waist cut in the bar in the position shown. (Fig. 3.) This waist was made $\frac{3}{4}$ in. long by $\frac{1}{4}$ in. diameter except for the shoulder at one end, which was left 0.001 in. oversize. A $\frac{1}{8}$ in. landing groove was cut at the other end of the waist, which was then screwed 26 t.p.i.

The bar was next turned on the outside to a good running fit in the change-wheel bushes, and parted off at the landing groove, after which a $\frac{1}{4}$-in. B.S.F. split die was run down the screwed portion. The stud was then case hardened.

The washer was then pressed on to the shoulder, the nut fitted, and a 2-B.A. cap head screw (Allen screw) inserted in the tapped hole.

In use, the nut is placed in the change-wheel quadrant, where it can slide freely in its slot, and the stud screwed into the nut, using the hexagon key from the bearing cap screws.

To set up a train, the 2-B.A. screw is removed with the hexagon key from the backgear sliding key, the change-wheels assembled on their bushes as required, slipped over the studs and put into mesh. The stud is then tightened into its nut, after which the 2-B.A. screw is replaced, first applying a smear of grease to the end or to the hole.

In this way the most complex gear-train can be set up in two or three minutes. I even use it for rough grooving 6-B.A. threads before applying a split die.

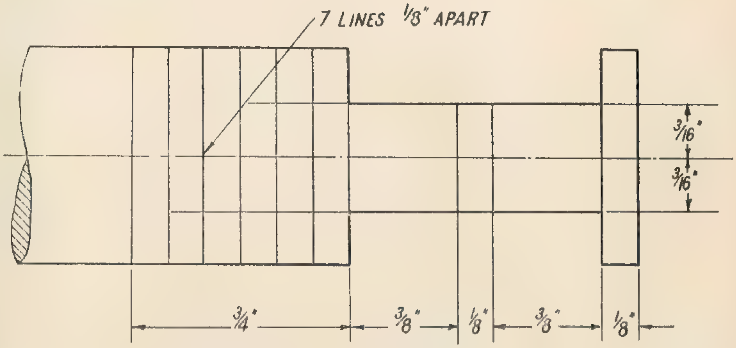


Fig. 2. Scribed lines on bar for parting off nuts and washers

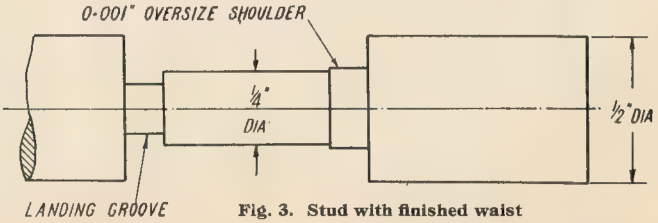


Fig. 3. Stud with finished waist

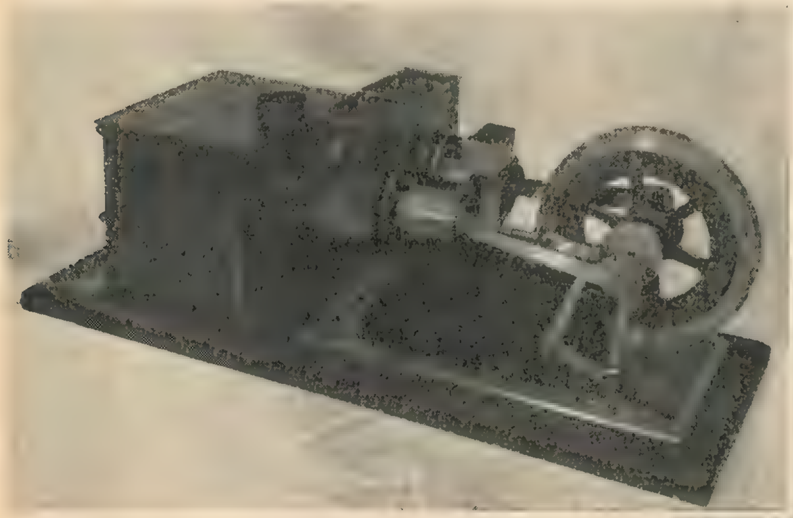
READERS' LETTERS

Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.

HOT AIR ENGINES

DEAR SIR,—I enclose a photograph of a model hot air engine built by my father some 40 years ago. It was a scaled-up copy of a cheap German toy bought in Tenby near Pembroke Dockyard in 1915. This, believe it or not, complete with lamp, filler, and oilcan, cost 7s. 6d.

The only difference between the subject of the photograph and the original are the double connecting-rods, the water jackets, and the fact that the main and displacer cylinders are separated by two asbestos washers and suitable flanges.



The disadvantages of the design are obvious, and unless a steady drip feed of oil is supplied to the displacer-rods, friction pulls the speed down by half. The bore and stroke of the working cylinders is $1\frac{1}{2}$ in. by $1\frac{3}{4}$ in., while the stroke of the displacer is just over 2 in. The engine has never done any useful work, but when new, lit a 2-volt bulb by means of a suitable generator. It was, however, built before the electricity age, when it was an achievement to get the engine to rotate at all; the model must have seen hundreds of hours' running, and has a very pretty action. Maximum revolutions, about 350.

The other photograph is of a full-size hot air engine found in Burma during the late adventures there. It was in working order, and drove a small centrifugal pump about 15 in. outside diameter. It was built by Ericcsons of (I think) Chicago. The working cylinder was water-cooled.

Yours faithfully,

R. E. VINNING, Major, R.A.O.C.

FIXING CROSSHEADS

DEAR SIR,—It was not until I read Mr. Austen-Walton's letter in THE MODEL ENGINEER for 27/1/55 that I realised that there had been a previous letter on the subject. For some unaccountable reason I missed Mr. Donaldson's letter of 9/12/54, or I would have replied before.

Truly, your correspondents lead a difficult life! If on the one hand they put forward figures in support of their arguments, they are immediately held up to ridicule as "theory hounds" and are told that their figures are "meaningless," as, to their traducers I can well believe them to be. The mistake made by this type of critic is in assuming that his own limitations are of universal application. If, on the other hand, one fails to supply figures, some other readers, quite reasonably, demand them; they have my sympathy.

Within the last three years, I have come across four model locomotives with crossheads fixed by the pin method, which have sheared their pins; one of them did it on *both* crossheads, and I would add that there was no evidence either of faulty material or poor workmanship. These cases, incidentally, have nothing to do with those mentioned by Mr. Austen-Walton.

The plain fact of the matter is that model locomotives working on load "up and down" on straight tracks are very rarely working at anything like maximum capacity. When you get a continuous track, with fairly long and stiff grades, it is quite a different story, as a good many $3\frac{1}{2}$-in. gaugers found out at Beech Hurst last season.

Under the conditions stated by Mr. Donaldson, the direct stress on the pin is about 5,700 lb. per sq. in., and as this is applied in alternating directions, we should add 25 per cent. to it, bringing it up to over 7,000 lb.

In addition, the joint is subject to shock loads of quite incalculable value. Many models do not have cylinder drain-cocks at all, while many others have them of inadequate size, and they are by no means always used when they should be, anyhow. The stresses arising from trapped water may be very high indeed, and I should regard the

stresses quoted, under these circumstances, as excessive. Mr. Austen-Walton's and my own personal experience would seem to support this view.

I maintain that although failures may be comparatively rare, though not so rare as Mr. Donaldson appears to believe, the single pin fixing method is poor practice, and cannot compare in efficiency with the flat cotter or the threaded joint; the latter has the added advantage that it provides reasonable longitudinal adjustment for piston-cylinder end clearance.

I have no desire to influence or scare anybody. One of your queryists asked for advice on the point at issue, I offered mine based on a fairly lengthy and varied experience.

Such advice as I can give is intended to help those who like to do their own thinking, and even their own designing. Mr. Donaldson is no more obliged to accept my ideas, than I am to accept the single pin crosshead fixing as sound practice.

Finally, the fact that a practice has existed for years without much (known and publicised !) trouble, is no proof that it is the best, or even that it is sound.

Yours faithfully,

Rustington. K. N. HARRIS.

TOWARDS THE IDEAL LATHE ?

DEAR SIR,—The best way to obtain the ideal lathe is probably to do as Martin Cleeve has done and modify a standard product to his own personal requirements, although in this case there must be many readers who do not regard some of the modifications as improvements.

Perhaps I may be allowed to comment on the modifications as they appear in the article. First, the provision of a rack-operated tailstock is certainly an improvement, but by turning the operating spindle through 22½ deg., about a third of the applied effort is wasted—forcing the tailstock spindle against the side of the bore. The situation of the capstan necessitates turning clockwise to feed in the tailstock spindle; by placing the rack and pinion at the rear this could have been obviated.

A longer cross-slide is an advantage, but provision of a vernier reading on the cross-slide feedscrew would appear impracticable. Is it possible to apply a cut of 0.0001 in. on a lathe of this size ? In contrast to this, it is interesting to note that no fine adjustment is fitted to the saddle stop.

The quick-change back gear is, to my mind, the best modification of them all. Disengagement of the direct drive on the M.L.7 is one of the few bad points in its design, and even without coupling the sliding movement with the raising of the back gears into mesh the Martin Cleeve arrangement appears excellent.

The difficulty is that the belt would probably suffer if the Myford motorising attachment is still employed.

I consider that the self-act gearbox is a poor substitute for the screwcutting gearbox, whilst being nearly as intricate. It appears to offer a very wide, but probably unnecessary, range of fine feeds, whilst the comparatively simple screwcutting gearbox designed by L. H. Sparey provides a range of feeds from 7 to 364 t.p.i.

The new fitting for the change wheel banjo that Martin Cleeve has designed is an excellent idea; it could well be used on all lathes of this type.

Like some of the other modifications, the increase in centre height has probably been carried out with a particular type of work in mind. I imagine this also applies to the provision of thirty forward and reverse speeds from a countershaft; there can be few amateur users who would forgo the compact Myford drive unit in favour of a countershaft for this reason.

Lest my criticisms be misconstrued, I might add that I am looking forward to reading more of your contributor's articles in future issues of THE MODEL ENGINEER.

Yours faithfully,

Lowestoft. C. WASTELL.

OLD GAS ENGINES

DEAR SIR,—I read with interest the letter from Mr. J. Brice of Witney in which he mentions a gas engine with the name "Stockport" and "Andrews & Co."

I have in my possessions two volumes of *Modern Power Generators* which contain sectional cardboard models of various types of boiler, engines, etc.

There are two photographs of "Hornsby-Stockport" gas engines, neither of which had a bent crank. They were made by Andrew & Co., and were known in France as the "Triomphe" engine.

One of the engines illustrated was a 6 h.p. fitted with special vibrating-weight type governors, but the larger engine was controlled by a centrifugal ball governor.

Incidentally, in addition to the main bearings on the large engine bedplate, the flywheel side of the shaft was supported on an extra bearing.

When using producer gas, the consumption of anthracite was stated to be about 1¼ lb. to 1¾ lb. per horse power hour.

Andrews (Stockport) exhibited their engines at the Antwerp Exhibition in 1884.

Yours faithfully,

Dukinfield. W. SIMONS.

For the BOOKSHELF

Lathe and Shaping Machine Tools. By "Duplex" (London) Percival Marshall & Co. Ltd.). 74 pages, 77 illustrations. Price 3s. 6d.

This book deals with the single-point cutting tools as used on lathes, shapers, planers and slotting machines, the design and principles of which has much in common. The materials used for making tools, the formation of cutting edges for machining various metals, types of tools for various operations, and tool holders are described and the concluding chapter deals with methods of sharpening tools.

Great North of Scotland Railway. (Published by the Stephenson Locomotive Society.) 44 pages, 5 in. by 7½ in. Illustrated. Price 3s. 6d. by post.

To mark the centenary of the Great North of Scotland Railway, the September, 1954, issue of the *Journal of the Stephenson Locomotive Society* was devoted entirely to the history of that railway, its rolling-stock, equipment and locomotives. The survey is comprehensive although it is, of necessity, brief. There are twenty-eight halftone illustrations, several of which are rare and extremely interesting; most of them depict locomotives and rolling-stock from the earliest years, but the rest are views of typical and distinctive engineering features of the line. There is a map on which every station on the railway is marked, and there is also a reproduction of a well-executed drawing of the company's coat-of-arms. Numbers, names and leading particulars of the locomotives are given, but a curious omission is any mention of the numbers of the "V"-class 4-4-0 engines, when all the others are stated. There are some extracts from the G.N.S.R. Appendix to the Rule-book, making interesting and often amusing reading.

Copies of this timely and, in every way, excellent production can be obtained from T. P. Hally-Brown, C.A., 29, Waterloo Street, Glasgow, C.2.

Great Trains of the World, by Wyatt Blassingame. (London: Publicity Products Ltd.) 68 pages, 8 in. by 10½ in. Price 4s. 6d. net.

This book should be welcomed by anyone looking for a bright, inexpensive gift book for a railway-minded youngster; it is one of its publishers' "Winner Book" series, and it fully meets its purpose. It illustrates and briefly describes a number of the most famous railway trains in the world. The stories are brief, but they are reasonably accurate, with some touches of humour and drama, not to mention excitement, to flavour them. The illustrations, most of which are reproduced in colour, are attractive if not, in all cases, strictly correct; they are all taken from original paintings, a few of them adding their quota of humour to the book. A nice thought is the inclusion of a sketch map showing the main route of each train described. A nice study of the Cross-Channel packet boat, *Cote d'Azur*, with the white cliffs of Dover in the background, is especially pleasing.

WITH THE CLUBS

Harrow and Wembley Society of Model Engineers

The recent A.G.M. revealed a very healthy state of affairs, with a steady increase in membership during 1954. A number of interesting lectures and film shows, etc., have been arranged for this year, which will cater for those interested in locomotive, marine, and general model engineering. The overhaul of the society's 700-ft. continuous track at the B.R. London Midland Region Sports Ground, Headstone Lane, is in hand, ready for the opening on Easter Sunday, April 10th, and it is proposed to complete the 2½-in gauge track at an early date. The Marine Section members will be out on their own water as soon as the weather permits.

Meetings are held on the 2nd and 4th Wednesdays in the month at the society's headquarters, Heathfield School, College Road, Harrow (opposite Harrow-on-the-Hill Station), and visitors are cordially invited.

Future programme:

March 9th : Lecturettes. All sections.

March 23rd : Locomotive Section Meeting. "Bits and Pieces."

Hon. Secretary : K. D. Carter, "Hedgeley," South Approach, Moor Park Road, Northwood, Middlesex.

Rednal and District S.M.E.

At the recent annual general meeting, which was well attended by members, it was reported that the extension to the club's 3½-in. and 5-in. gauge track was now almost completed, and much work had been done at the Barnt Green site. The portable track had been to four shows, and thanks were expressed to Mr. J. Strickland for the magnificent work done by his locomotive.

The officers were elected for the coming year.

The meeting was concluded by a resolution being passed that work on building the club's 5-in. gauge *Netta* locomotive should be speeded up, also that members (the secretary included) must complete their respective engines.

Hon. Secretary : J. Tarrant, 38, Middle Drive, Rednal.

Exeter and District M.E.S.

The annual general meeting of the society took place on Saturday, February 5th, at the headquarters, St. David's Hill, Exeter, and was well attended. Mr. E. O. Harding, our president for so many years, announced that, for professional reasons, he wished to relinquish his office; after some discussion we reluctantly accepted his resignation and elected him to become a vice-president.

Mr. G. J. Websdale, D.S.O., M.C., A.M.I.E.E., who has been our very popular chairman for some years, was elected president.

Mr. W. J. Hunt was selected as chairman following his many useful activities on the society's behalf and his years as vice-chairman. All the remaining officers were re-elected for 1955.

The hon. secretary gave a very good account of the society's activities during the past twelve months, and the hon. treasurer gave details of our finances, which we have every reason to be satisfied with.

It was decided to discontinue our "Bulletin," as at present published, and to substitute a monthly news sheet, with the object of keeping members more up-to-date with the fixtures, as they draw near.

Hon. Secretary : L. M. R. Hiscocks, 5, Prince Charles Road, Exeter.

Salisbury & District M.E.S.

A successful year's working was reported at the A.G.M. held on February 10th. There had been a net increase in membership of 26; the society was able to pay off all outstanding debts, and an accumulated deficit over the last two years had been turned into a small surplus. The society had been active in many ways during the year and future plans include the completion of the rail-car track and "OO"-gauge layout; the laying down of a 70-ft. diameter car track; the construction of a portable multi-gauge locomotive track, a small furnace for casting, and improvements to the workshop.

Owing to the growth of the society, it has been organised into separate sections for aircraft, general engineering, railways and cars, who each meet on a separate night in the workshop.

Future events include a film show on March 10th, and visits to Andover's traction engine rally, and the Veteran Car Rally to be held in Salisbury in July are projected.

Hon. General Secretary : R. A. Read, 90, Woodside Road, Salisbury.

Norwich & District S.M.E.

At the meeting of the above society to be held at The Assembly House, Theatre Street, Norwich, on March 9th, 1955, at 7.30 p.m. an informal discussion by the members of the society modelling in "OO"-gauge is being arranged.

We shall be pleased also to see any models ("OO"-gauge or otherwise) which are under construction, and to learn how they are progressing.

Hon. Secretary : A. A. Taylor, 150, Furze Road, Thorpe, Norwich.

The Junior Institution of Engineers

Friday, March 4th, at 7.0 p.m. Pepys House, 14, Rochester Row, S.W.1. Film evening.

Friday, March 11th, at 7.0 p.m. Pepys House, 14, Rochester Row, S.W.1. Ordinary meeting Paper—"The Rolling of Structural Sections," by W. H. Bailey (member).

Sheffield and District Section. Monday, March 14th, at 7.30 p.m. at Livesey Clegg House, (opposite Union Street Cinema), Sheffield. Ordinary meeting : Paper—"The Reconstruction of a Soaking Pit Building," by K. H. Best, B.Eng., A.M.I.C.E. (Husband & Co. Ltd.).

Friday, March 18th, at 7.0 p.m. Pepys House, 14, Rochester Row, S.W.1. Informal meeting : Paper—"Some Notes on the Flow of Fluids," by R. F. Twist (South Eastern Gas Board).

Friday, March 25th, at 7.0 p.m. Pepys House, 14, Rochester Row, S.W 1. Ordinary Meeting : Paper—"Amateur Telescope Making," by Dr. R. D. Gifford (member).

Friday, April 1st, at 7.0 p m. Pepys House, 14, Rochester Row, S.W.1. Film evening.

Midland Section. Wednesday, April 6th, at 7.0 p.m. at the James Watt Memorial Institute, Gt. Charles Street, Birmingham. Combined meeting with Newcomen Society—"Machine Tools—Historical Development—Future Trends."

Merseyside L.S. & M.E.

The annual general meeting was held on January 26th, 1955, and the officers to serve for the next twelve months were elected.

Meetings are held fortnightly on Wednesday evenings at the Wavertree Community Centre, Penny Lane, Liverpool. A continuous multi-gauge track and a workshop, comprising two lathes, planer and drilling machine are available at all times at the above premises.

Hon. Secretary : J. Benn, A.M.I.Mech.E., 36b, Judges Drive, Liverpool, 6. Tel.: Anfield 6829.

The Northern Association of Model Engineers

At the annual general meeting of the association, held on February 5th, and attended by 20 representatives from 13 of the affiliated societies, the officers elected were as follows :—

President : R. O. Harper (Eccles M.E.S.).

Chairman : J. H. S. Williams (Sale M. & E.C.), 154, Park Road, Timperley, Cheshire.

Vice-chairman : W. Dawson (Bolton & District S.M.E.), 70, Rawson Street, Farnworth, Bolton.

Secretary : P. Symond (Manchester S.M.E.E.), 33, Grangethorpe Drive, Burnage, Manchester, 19.

Treasurer : H. P. Stamworth (Blackburn & District Live Steamers), 31, Laxey Road, Blackburn.

Council : R. Blackburn (Bolton & District S.M.E.), C. L. Heworth (Manchester S.M.E.E.), W. Taylor (Urmston & District S.M.E.E.), B. Underwood (Ashton-under-Lyne M.E.S.).

Auditors : A. F. Duckitt (Merseyside Live Steam & M.E.S.), W. E. Harker (Southport M. & E.C.).

The Gauge "1" Model Railway Association

The association will again provide an exhibit at the Model Railway Club Exhibition at Central Hall, Westminster, April 12th-16th. L.C.C. regulations make it impracticable to run steam locomotives on the working layout, but it is expected that some of our members' efforts in this field will be on show on the static display stand ; it is hoped to provide something of interest to live steam fans who visit the exhibition.

The electrically operated working layout will be very similar to last year's track, which was fully interlocked, and operated in the correct manner with the use of bells between the operators.

The association exists to encourage Gauge "1" modelling in all its aspects, and enthusiasts visiting the exhibition are invited to contact the secretary or any of the stand stewards. Members are reminded that a visitors and members book is kept on the stand throughout the exhibition.

Hon. Secretary : J. T. van Riemsdijk, 40 Bancroft Avenue, London, N.2.

Edinburgh S.M.E.

Norman McKillop, "Toram Beg," entertained, with his railway reminiscences, members and friends on the evening of February 8th. His stories were greatly enjoyed and ranged from driving Royal Trains to the "Cock o' the North."

Our next meeting is a club night on March 8th at 7.30 p.m., 52, Queen Street, Edinburgh. It is hoped that members will bring along samples of their work.

The club rooms at 1a, Ramsay Lane, Lawnmarket, Edinburgh, are open from 7.0 p.m. on Tuesday evenings and 3.0 p.m. Saturday afternoons; all interested are welcome.

Hon. Secretary : J. H. Farr, Wardie Garage, Ferry Road West, Edinburgh 5.

The Croydon Society of Model Engineers

At the annual general meeting, the balance sheet for 1954 revealed the club as being in a very sound financial position. Club meetings will continue to be held at "Highlands," No. 1 Duppas Hill Road, Croydon, every Thursday evening at 8.0 p.m. Lectures, talks and film shows have been arranged as follow :—

March 10th. Talk on "Building Boat Hulls," by Mr. N. Peters, and talk on "Speed Boats," by Mr. E. Walker.

March 24th. Rummage Sale.

April 7th. Film Show.

April 21st. Locomotive night—discussions and demonstrations.

May 5th. Lecture illustrated by lantern slides, by Mr. R. Wilson—"Thames Cruising."

Intending members and visitors are always welcome. All communications should be addressed to Hon. Secretary : Van Cooten, 29, Kingsdown Avenue, South Croydon.

CONDITIONS OF SALE

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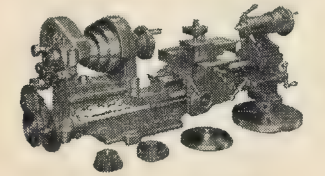

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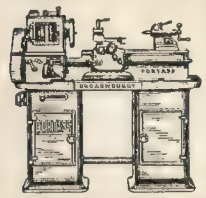

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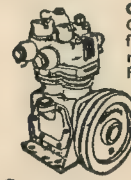

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THE MODEL ENGINEER

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